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REV. NO. 0

FINAL DRAFT
SITE INSPECTION REPORT
MILLMASTER ONYX CORPORATION
BERKELEY HEIGHTS TWP., NEW JERSEY

PREPARED UNDER
TECHNICAL DIRECTIVE DOCUMENT NO. 02-8907-35
CONTRACT NO. 68-01-7346

FOR THE

ENVIRONMENTAL SERVICES DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 22, 1989

NUS CORPORATION
SUPERFUND DIVISION

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SITE NAME:	Millmaster Onyx Corporation	**EPA ID NO.:**	NJD001807304
ADDRESS:	11 Summit Avenue	**LATITUDE:**	40° 41' 15" N
	Berkeley Heights Twp, New Jersey	**LONGITUDE:**	074° 26' 38" W
		BLOCK:	201
		LOT:	1

1.0 SITE SUMMARY

The Millmaster Onyx Corporation site is located in Berkeley Heights Township, Union County, New Jersey. The site is bounded by McClellan Street to the southeast, Summit Avenue to the northeast, the Passaic River to the north and northwest, and Plainfield Avenue to the southwest. The site is approximately 4.8 acres in size and slopes gently to the northwest towards the Passaic River. Geographically, the site is located along the southeast side of a ridge known as Long Hill; northwest of this ridge lies the Great Swamp National Wildlife Refuge. There are approximately 33,000 residents within a 3-mile radius of the site.

The site property was formerly owned by Millmaster Onyx Corporation, a division of Kewanee Industries. In 1977 Gulf Oil Chemicals Company, a division of Gulf Oil Corporation, purchased Kewanee Industries and its interests. Chevron Chemicals Company purchased Gulf Oil Corporation and its interests on November 13, 1985 and is now the current owner of the Millmaster Onyx property.

Millmaster Onyx began its plant operations in 1945 as a manufacturer of organic specialty chemicals and pharmaceuticals. In October of 1981, the plant ceased operations due to economic reasons; subsequently in May and June of 1982, the plant buildings and equipment were dismantled and removed from the site. The site is reportedly inactive at the present time. Millmaster Onyx submitted an owner/operator notification form, RCRA 3001, on March 1, 1982. They also held a New Jersey Pollutant Discharge Elimination System Permit (NJPDES), No. NJ0003042, from approximately 1972 until it was terminated by an Affidavit of Exemption on March 10, 1983. Background information indicates three environmental incidents occurring at the site as well as numerous complaints from area residents concerning odors that may have emanated from the plant.

In 1967 a transformer explosion at the plant caused a fire and a release of polychlorinated biphenyls (PCBs) on the site property. On March 29, 1978, an overflow of a process vessel containing 2,2-dichlorovinyl occurred inside building No 1. The spill appeared to be contained within the building, but odors emanating from the building resulted in numerous complaints from area residents. On October 2, 1981, a xylene spill on site resulted in a release flowing into the Passaic River. The New Jersey Department of Environmental Protection (NJDEP) Division of Water Resources (DWR) imposed a $5,000 fine on the company as a result of this incident.

Research of the background information indicates that wastes suspected and confirmed to be present on site include 2,4,5-trichlorophenol (2,4,5-TCP), PCB contamination in the form of Aroclor-1248, and numerous volatile organic compounds including xylene, chlorobenzene, ethylbenzene, and toluene. The background information also indicates the waste units of major concern on site include four unlined lagoons, one of which may contain 10 to 40 buried, sludge-filled drums. Contamination has been found in the on-site soils, groundwater, and in sediments of the Passaic River directly adjacent to one of the lagoons.

In June of 1983, the NJDEP performed a site evaluation at the Millmaster Onyx site in Berkeley Heights as part of a state-wide dioxin survey. This occurred as a result of the facility's two trial runs, one in 1957 and again in 1967, in the production of triethanol amine salt of silvex. During the production process, 2,4,5-trichlorophenol (2,4,5-TCP) was used as a raw material, and a resultant waste by-product of this process was a dioxin compound: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8,-TCDD). The supplier of 2,4,5-TCP indicated that the typical dioxin contamination level for the 1957 test run was 1 ppm, and 0.5 ppm for the 1967 test run. Both trial runs were uneconomical and no further runs were made. The resultant lab analysis showed 23 of 25 environmental samples had no detectable levels of dioxin. One sample had a trace level of 0.7 ppb. At that time the Commissioner of the NJDEP stated that based on these findings the site could be removed from the dioxin list. The dioxin survey had interrupted the ongoing site cleanup of PCB and volatile organic compound (VOC) contamination. The cleanup at the site for PCBs and VOCs was a result of the discovery, by Gulf Oil, of discolored soil near one of the buildings that was being dismantled. The PCB and VOC contamination on site is believed to be associated with four unlined lagoons, one of which may contain up to 10 to 40 buried, sludge-filled drums.

Current enforcement actions include an Administrative Consent Order (ACO) that Chevron Chemicals Company, the current owner, has entered into with the NJDEP. Currently the site is in the Remedial Investigation/Feasibility Study (RI/FS) phase of cleanup.

An on-site reconnaissance was performed by NUS Corporation Region 2 FIT personnel at the Millmaster Onyx site on August 17, 1989. No samples were collected as sufficient analytical data exist for the site. During air monitoring activities, readings greater than 1,000 ppm were detected on the OVA and HNu at the opening of a vent pipe used during a vacuum extraction test at the Clear Water Lagoon. Air monitoring of the ambient air conditions for the entire site yielded no readings above background.

Ref. Nos. 1-22

2.0 SITE INSPECTION NARRATIVE

2.1 EXISTING ANALYTICAL DATA

Extensive soil, sediment, groundwater, and river water sampling has occurred on the Millmaster Onyx site. During June of 1983, the NJDEP had asked Gulf Oil & Chemical Company to participate in a statewide dioxin contamination survey being conducted in New Jersey. This site was being investigated because background file information indicated Millmaster Onyx had performed two test runs in 1957 and 1967 of the production of silvex amine salt, utilizing the compound 2,4,5-trichlorophenol (2,4,5-TCP). A total of 25 soil, sediment, and river water samples were collected and analyzed for dioxin contamination. Of the 25 samples taken, 23 showed no detection of dioxin. One sample was not analyzed due to interference, and one sample showed a trace level of 0.7 ppb dioxin. Based on this evidence, the NJDEP removed the site from their potential dioxin contamination list.

During November of 1983, Engineering-Science, Inc. (Gulf's consultant) in conjunction with ETC, Inc. laboratory had performed soil, sediment and groundwater sampling at the Millmaster Onyx site. The samples were analyzed for volatile organics, heavy metals, and PCBs (namely Aroclor-1248). Lab analysis results indicated groundwater contamination by volatile organic compounds (VOCs), heavy metals, and polychlorinated biphenyls (PCBs). Some of the detected VOCs included chlorobenzene (2,830 ppb), ethylbenzene (21,600 ppb), toluene (3,110 ppb), and 1,2-dichlorobenzene (393 ppb). Some detected heavy metals included chromium (58 ppb), arsenic (10 ppb), copper (300 ppb), lead (90 ppb), and mercury (0.6 ppb). Detected PCBs in the form of Aroclor-1248 occurred at 15 ppb. The monitoring well sample results are listed in Table 1. All results are reported in micrograms per liter, i.e., ppb.

Analysis of soil samples taken from the north and south trenches of the chemical sewer lagoon indicated VOCs and metals contamination. VOCs were detected in the following ranges: chlorobenzene (950-5,290 ppb), ethylbenzene (510-2,840 ppb), methylene chloride (640-720 ppb), toluene (110 ppb), and 1,2-dichlorobenzene (52-553 ppb). Heavy metal contamination in soils included arsenic (6 ppb), chromium (10-20 ppb), copper (27-36 ppb), mercury (0.4 ppb), and zinc (18-22 ppb).

Analysis of soil samples taken from the Clearwater Lagoon area by Roy F. Weston during January 1983 indicated the presence of PCBs (Aroclor-1248) ranging in concentrations from 10-6,000 mg/kg dry weight.

Analysis of soil samples taken from the south chemical lagoon indicated the presence of VOC, heavy metal, and PCB contamination. The VOC contamination included methylene chloride (0.17-190 mg/kg), ethylbenzene (0.07-110 mg/kg), and xylene (0.13-1,100 mg/kg). The heavy metal contamination included arsenic (0.3-2.5 mg/kg), chromium (13-43 mg/kg), lead (35-219 mg/kg), and mercury (0.1-8.1 mg/kg). The PCB contamination ranged from 0.04 to 182 mg/kg.

Analysis of soil samples taken from the Lagoon Dredged Material Disposal Area indicated contamination by VOCs, PCBs and heavy metals. The detected VOCs included chlorobenzene (0.02-16 mg/kg), ethylbenzene (0.05-280 mg/kg), methylene chloride (0.18-190 mg/kg), toluene (0.07-29 mg/kg), and xylene (0.96-1300 mg/kg). PCBs were detected in the range of 0.05-3.6 mg/kg. The detected heavy metals included arsenic (1.2-2.5 mg/kg), chromium (21-39 mg/kg), copper (4-44 mg/kg), lead (48-71 mg/kg), mercury (0.2 mg/kg), and zinc (84-265 mg/kg).

Analysis of soil samples taken from the Product Storage Area indicated contamination by VOCs, heavy metals, and PCBs. The detected VOCs included chlorobenzene (0.03-5.2 mg/kg), ethylbenzene (0.24-120 mg/kg), toluene (0.03-6.6 mg/kg), and xylene (1.3-850 mg/kg). The detected heavy metals included arsenic (0.10-3.9 mg/kg), mercury (0.6-0.8 mg/kg), and zinc (0.6-219 mg/kg). PCBs were detected in a range of 0.06 to 52 mg/kg.

Sampling of off-site areas included the entire perimeter of the site and the southern bank of the Passaic River (to the north of the site). The sample media included soil borings, surface soil samples, river water samples, and river sediment samples. Analysis of soil samples indicated VOC, heavy metal, and PCB contamination. The detected VOCs included xylene (0.05-0.08 mg/kg) and ethylbenzene (0.03-0.08 mg/kg). The detected heavy metals included arsenic (0.9-2.0 mg/kg), chromium (12-43 mg/kg), copper (8-210 mg/kg), lead (14-110 mg/kg), mercury (0.2-4.9 mg/kg), and zinc (23-330 mg/kg). PCBs were detected at concentrations ranging from 0.06 to 179 mg/kg.

River water and river sediment samples were collected from the Passaic River on September 18, 1985. These samples were collected near the former Product Storage Area (PSA), the former Clean Water Lagoon (CWL), and also 500 ft upstream and downstream of these areas. No contamination of river water above detectable limits was observed. However, analytical results of river sediment samples collected near the PSA detected PCBs at a concentration of 5.5 mg/kg. Analytical results of river sediment samples collected near the CWL and PSA detected Benzo(b + k)-fluoranthene at concentrations of 0.80 mg/kg.

It should be noted that the data presented in this summary and in Table 1 represent a portion of the total number of parameters analyzed for. Please refer to the following references for the complete parameters analyzed for from the Millmaster Onyx site.

Ref. Nos. 7; 8; 9, pp. 5.1-5.97, Appendix H, Tables 5.7, 5.8, 5.10, 5.14

TABLE 1

ENVIRONMENTAL TESTING AND CERTIFICATION - SAMPLING RESULTS
OBSERVATION WELLS - DEEP AND SHALLOW (OW-D, OW-S)
MONITORING WELLS - DEEP AND SHALLOW (MW-D, MW-S)
(UNITS IN PPB)

Parameters	OW1-D	OW1-S	OW2-D	OW2-S	OW3-D	OW3-S
Ethylbenzene	ND	ND	ND	21,600	ND	ND
Tetrachloroethylene	115	ND	ND	BMDL	ND	ND
Methylene Chloride	BMDL	BMDL	BMDL	109	BMDL	BMDL
Toluene	ND	ND	BMDL	3,110	ND	ND
1,2-Trans-Dichloroethylene	59	ND	ND	316	ND	ND
Trichloroethylene	59	BMDL	ND	BMDL	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	393	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	60	ND	ND
Arsenic	ND	BMDL	ND	10	BMDL	ND
Chromium	58	BMDL	23	36	45	25
Copper	300	21	150	110	210	70
Lead	90	ND	BMDL	BMDL	BMDL	BMDL
Mercury	0.4	0.6	BMDL	BMDL	BMDL	BMDL
Nickel	110	BMDL	58	40	93	51
Zinc	600	51	130	240	240	120
Cyanide, Total	-	<25	<25	<25	36,000	<25
Phenolics, Total	-	<50	<50	110	<50	<50
Aroclor-1248	ND	15	ND	ND	ND	ND

BMDL - Below method detection limit
ND - Not detected
\- Parameter not tested

TABLE 1 (Cont'd)

ENVIRONMENTAL TESTING AND CERTIFICATION - SAMPLING RESULTS

OBSERVATION WELLS - DEEP AND SHALLOW (OW-D, OW-S)

MONITORING WELLS - DEEP AND SHALLOW (MW-D, MW-S)

(UNITS IN PPB)

Parameters	OW4-D	OW4-S	MW1-D	MW1-S	MW2-D	MW2-S
Ethylbenzene	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	BMDL	357	ND	ND
Methylene Chloride	11	12	BMDL	14	BMDL	BMDL
Toluene	ND	ND	ND	ND	ND	ND
1,2-Trans-Dichloroethylene	BMDL	ND	BMDL	ND	ND	ND
Trichloroethylene	182	BMDL	BMDL	BMDL	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND
Arsenic	ND	BMDL	13	BMDL	BMDL	BMDL
Chromium	23	15	54	BMDL	BMDL	BMDL
Copper	120	20	210	12	21	26
Lead	ND	BMDL	60	ND	ND	ND
Mercury	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Nickel	56	19	84	12	18	BMDL
Zinc	170	29	560	30	32	12
Cyanide, Total	<25	<25	29	32	<25	28
Phenolics, Total	<50	<50	<50	<50	<50	<50
Aroclor-1248	ND	ND	ND	ND	ND	ND

BMDL - Below method detection limit
ND - Not detected

TABLE 1 (Cont'd)

ENVIRONMENTAL TESTING AND CERTIFICATION - SAMPLING RESULTS

OBSERVATION WELLS - DEEP AND SHALLOW (OW-D, OW-S)

MONITORING WELLS - DEEP AND SHALLOW (MW-D, MW-S)

(UNITS IN PPB)

Parameters	MW3-D	MW3-S	MW4-D	MW4-S	MW5-D	MW5-S
Ethylbenzene	ND	ND	ND	6,420	345	ND
Tetrachloroethylene	ND	BMDL	ND	ND	ND	ND
Methylene Chloride	BMDL	BMDL	BMDL	ND	BMDL	317
Toluene	ND	ND	BMDL	940	121	1,850
1,2-Trans-Dichloroethylene	ND	ND	ND	ND	ND	BMDL
Trichloroethylene	BMDL	BMDL	BMDL	ND	ND	BMDL
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND
Arsenic	ND	BMDL	BMDL	6	ND	BMDL
Chromium	23	21	BMDL	BMDL	18	39
Copper	81	38	56	34	120	250
Lead	BMDL	ND	ND	ND	ND	BMDL
Mercury	BMDL	ND	BMDL	0.5	BMDL	BMDL
Nickel	35	25	16	19	35	35
Zinc	200	120	43	32	75	90
Cyanide, Total	<25	<25	<25	31	<25	26
Phenolics, Total	<50	<50	1,400	9,000	3,200	36,000
Aroclor-1248	ND	ND	ND	ND	ND	ND

BMDL - Below method detection limit
ND - Not detected

2.2 WASTE SOURCE DESCRIPTION

There are four types of waste sources that were present on the site at one time or another. They include:

- Surface Impoundments/Landfill
  - Clear Water Lagoon (CWL)
  - North and South Chemical Lagoons (NCL, SCL)
  - Chemical Sewer Lagoon (CSL)
  - Chemical Lagoon Dredged Material Disposal Area (DMDA)

- Piles
  - Temporary Soils Storage Area (TSSA)

- Aboveground Tanks
  - Product Storage Area (PSA)

- Other
  - Heat Exchanger Area near the former building No. 5 (source of 1967 PCB explosion/spill)

The Clear Water Lagoon (CWL) was located in the north central portion of the site. It was roughly oval to peanut shaped with an estimated size of 110 ft by 40 ft. From test soil borings in the lagoon, it was estimated to be 15 to 21 ft deep. The lagoon stored noncontact cooling water from plant operations and storm drainage water from the site. Water from the CWL was chlorinated and then could be pumped back to the plant for reuse as cooling water or discharged into the Passaic River. The volume of wastes in the lagoon is not known. The lagoon is believed to be unlined. Analysis of samples from the CWL indicate soil and groundwater contamination by PCBs, volatile organics, phthalates, polynuclear aromatics, and chlorinated benzenes. The physical state of these waste types is liquid. There are no known spills at this waste unit. When the plant buildings were demolished in May and June of 1982, this lagoon was drained and backfilled with material from the plant site.

The North and South Chemical Lagoons (NCL and SCL) were located along the southwest side of the site. Each lagoon was estimated to be approximately 60 ft by 60 ft square as determined by an aerial photograph taken in 1969. Test borings in the SCL indicate its size to be approximately 80 ft by 100 ft, with a depth ranging from 12.5 feet in the southern portion to as much as 21 feet in the northern portion. Both of these lagoons are believed to be unlined. The volume of wastes in each lagoon is unknown. The two lagoons were constructed in 1957 after closure of the Chemical Sewer Lagoon, and were in operation until 1974.

In 1974, the two lagoons were taken out of service and backfilled. A concrete slab was placed over the NCL and was used as a drum storage area. A wastewater holding tank was constructed at the site of the SCL. Investigation of the NCL is limited to its outside perimeter because the waste unit is covered with concrete. The two lagoons were used as oil/water separation areas, with the SCL being constructed first, followed by the NCL. Analysis of samples taken from the SCL indicate the presence of volatile organics, PCBs, base/neutral compounds, and in some instances priority pollutant pesticide compounds (found in the top 2 ft of several borings). Analysis of two borings taken from the SCL indicated elevated concentrations of mercury. The physical state of the waste types can be classified as liquid.

The Chemical Sewer Lagoon (CSL) was located southeast of the Clear Water Lagoon and was used to impound process wastewater for an unknown period of time, ending with its closure in 1957. At closure the CSL was filled in and a building was constructed over it. From soil borings in the CSL its size is estimated to be approximately 60 ft by 70 ft, with depth ranging from 5 ft to 15 ft, south to north. This lagoon is also believed to be unlined. The volume of wastes in the CSL is not known. Several buried drums were found in the CSL during test pit/trench excavations performed by Roy F. Weston in 1982 and Engineering Science in 1983. One of the drums found by Roy F. Weston contained a black oily liquid, and one drum found by Engineering-Science contained a tar-like substance. The remaining drums appeared to contain the surrounding soil. Analytical results of soil and groundwater samples taken from the CSL indicated the presence of volatile organics, base/neutral compounds, and PCBs.

The last surface impoundment/landfill area includes the Chemical Lagoon Dredged Material Disposal Area (DMDA). The DMDA is located in the northwest corner of the site. The size of this area, as determined by test borings and a scale map in an Engineering-Science Report, is estimated to be approximately 60 ft by 40 ft, and ranging in depth from 12 to 22 ft. Interviews with former Millmaster Onyx employees, conducted by an unknown party, revealed that material dredged from the North Chemical Lagoon was buried in this area. During the 1960s, a concrete slab was constructed over the DMDA; also during this time the DMDA was used as a drum storage area. Analytical results of samples taken at the DMDA indicate the presence of volatile organics, base/neutral compounds, and PCBs. The DMDA is believed to be unlined. The volume of wastes in the DMDA is not known. The physical state of the waste types is believed to be liquid.

The Product Storage Area (PSA) was identified via aerial photographs as a one-time, aboveground tank storage area located in the northeast corner of the site, directly adjacent to the Passaic River. The PSA was included in this investigation because background information indicates oily substances were observed seeping from the PSA through the river bank. The size of the PSA, as determined from a scale map included in an Engineering-Science report, is estimated to be approximately 175 ft by 70 ft. The aboveground tanks were used to store solvents used by the plant. An aerial photograph of the site taken in 1969 shows that the PSA may have contained up to 14 aboveground storage tanks. It is assumed that miscellaneous spills may have occurred during the transfer of solvents to or from the tanks. It is not known what the total storage capacity is of the 14 aboveground tanks. It is also not known what type of containment, if any, existed for the PSA. Analytical results of soil borings taken in the PSA indicated the presence of volatile organics, base/neutral compounds and PCBs. The highest concentrations were noted along the western edge of the PSA, adjacent to the Clear Water Lagoon. Background information indicates that old storm drain lines crossed the PSA towards the Passaic River. It is believed that during periods of high groundwater levels, contaminants may have been transported via groundwater through the old storm drains and discharged as seepage at the river bank adjacent to the PSA.

During the on-site reconnaissance conducted by NUS Corporation FIT 2 on August 17, 1989, the waste unit described as "piles" was noted. This waste unit is also known as the Temporary Soils Storage Area (TSSA). Previous investigations by Roy F. Weston and Engineering-Science, Inc. involved the sampling and defining of potential off-site surface soils contamination by volatile organic compounds and PCBs. An interim off-site remedial action plan for the site was proposed by Engineering-Science and described in its reports, "A Report Describing an Interim Off-Site Remedial Action at the Gulf Oil Products Company's Former Plant Site, Berkeley Heights, New Jersey" (Engineering-Science, May, 1984) and "1985 Interim Off-Site Remedial Action, Berkeley Heights, New Jersey" (Engineering-Science, October, 1988). The off-site surface soils of concern that were excavated and moved to the on-site TSSA consisted of four distinct areas. They include the West Area, outside the west fence, which is estimated to be approximately 200 ft by 125 ft in size; the South Woods, outside the south fence near the southeast fence corner, approximately 160 ft by 65 ft in size; the North Slope, located outside the north fence adjacent to the Product Storage Area and the Clear Water Lagoon, approximately 240 ft by 30 ft in size; and the South Swale, located adjacent to and directly north of the North Slope area, approximately 145 ft by 40 ft in size. During the autumn of 1983 and again in the summer of 1985, the surface soils from these areas were excavated and moved to the on-site TSSA. The TSSA was designed as an interim measure storage area to temporarily store soils until they could be properly removed at the time of remediation. The TSSA exists on the concrete slab that was constructed over the North Chemical Lagoon. The general "bottom-up" containment design of the TSSA is as follows: the concrete slab, 4-inch sand cushion, 3x6 mil polyethylene liner, 3-inch sand cushion, 4-inch diameter perforated PVC pipes spaced approximately 6 feet apart, the excavated material, 6-mil polyethylene cover, 20-mil vinyl cover, 2 foot high berm around the edge, and fill material between the berm and the 20-mil vinyl cover to keep it stabilized. Analytical results of soil boring samples taken from these areas indicate the presence of ethylbenzene, chlorobenzene, other volatile organics, PCBs, and base/neutral compounds.

The last waste unit, described as "other", includes the heat exchanger which is reported to have been located in the former Building No. 5, in the southeast portion of the site. The heat exchanger system used oil that contained PCBs. In 1967, an explosion ruptured the heat exchanger piping system, resulting in a release of PCB-contaminated oil onto the surrounding area. The size of the waste unit is not known, but it is believed to be at least the size of Building No. 5 (approximately 30 ft by 25 ft) and possibly larger. The exact volume of PCB-contaminated oil lost is not known, but it is estimated to be approximately 300 to 600 gallons (this includes an estimated 3500 to 7000 pounds of PCBs). The resultant PCB contamination is limited mostly to surface soils in the southeast area of the site. However, movement of the soils to different on-site locations during demolition of the plant buildings has resulted in PCB-contaminated surface soils being scattered around the site In addition, surface erosion is believed to be responsible for the PCB contamination of off-site surface soils at the southeastern area of the site. It is believed that there was no containment associated with this waste unit. No other known miscellaneous spills or dumping have occurred at this waste unit. Analytical results of soil samples taken in this waste unit indicate high concentrations of PCB contamination. The contamination appears to be limited to the upper 18 inches of the soil. Relatively low levels of volatile organic contamination was found in this waste unit.

Ref. No. 9, pp. 5.1-5.97

2.3 GROUNDWATER ROUTE

The Millmaster Onyx site is located in the Highlands Province of New Jersey. In general, the site is underlain by alluvial deposits of the Passaic River, which are underlain by the Pleistocene deposits of Glacial Lake Passaic, which are underlain by the Triassic Age Brunswick Formation, the bedrock in the area of the site. Specifically, the site geology from top to bottom includes topsoil, fill, recent alluvium, glacial lake varved clays, and residual soil/weathered bedrock.

The topsoil is the surface deposit, interbedded with fill, and ranges in thickness from a few inches up to 5 feet. The topsoil maintains vegetation growth along the Passaic River. The topsoil consists of sandy, clayey silt with organic fibers, roots, etc.

Interbedded with the topsoil is the fill. The fill completely underlies the site and extends approximately 30 feet west and 50 feet north of the site security fence. The fill is a manmade feature meant to improve the surface topography and to raise the site above the Passaic River flood zone. The fill consists of fine to medium sand, silt, clay, gravel, cinders, metal, etc. Its thickness ranges from 4 feet at observation well 3 (OW-3) to as much as 20 feet in the Chemical Sewer Lagoon (CSL).

Underlying the fill is recent alluvium associated with the Passaic River. The deposits occur in a triangular shape formed by the northeast, northwest, and southwest corners of the site. The deposits, which thicken from south to north, range in thickness from approximately 1 foot at observation well 3 (OW-3) to 17 feet at monitoring well 4 (MW-4). The alluvium consists of stratified, medium to fine sand, silty fine sand, silt, silty clay, and clay. The alluvial deposits exhibited a saturated to wet characteristic, depending on the depth and proximity to the underlying glacial lake clays.

The glacial lake deposits underlie the recent alluvium and consist of silty clay, clay, silt, and fine sandy clayey silt. These deposits were formed during Pleistocene times in the Glacial Lake Passaic. The deposits exhibit a varved (layered) nature consisting of alternating seams of 1 to 6 inches of clay or silty clay and 0.25- to 0.5-inch seams of silt or fine sandy clayey silt. The deposits appear to be continuous underneath the site and thicken from south to north. Thickness ranges from 6 feet at monitoring well 6 (MW-6) to approximately 40 feet at monitoring well 2 (MW-2).

Lastly, underlying the glacial lake deposits is the residual soil/weathered bedrock. The residual soil is the upper weathered area of the bedrock, known as the Brunswick Formation. The Brunswick Formation exhibits a characteristic red-brown color and is composed of stiff clayey silt, silty sand, and sandy clay with numerous coarse sand particles and medium gravelly shale fragments. Underneath the site the bedrock dips from south to north-northwest ranging in elevation from 210 feet above mean sea level (MSL) to. 155 feet MSL. The thickness of the residual soil/weathered bedrock varies from approximately 2 feet at monitoring well 1 (MW-1) to 6 feet at observation well 1 (OW-1). The Brunswick Formation is estimated to be in the range of from 6000 feet thick to as much as 10,000 feet thick.

A test boring program at the site identified two water-bearing zones. They are:

- fill and alluvium (shallow water-bearing zone), and
- residual soil/weathered bedrock (deep water-bearing zone).

Separating these two water-bearing zones are the glacial lake varved clay deposits. These deposits act as an aquaclude and are continuous underneath the site; however, they are discontinuous within a 3-mile radius of the site. This discontinuity is caused by Long Hill, First Watchung Mountain, and Second Watchung Mountain; these are three basaltic ridges outcropping northwest and southeast of the site.

Because of these discontinuities, the two water-bearing zones will be considered as one hydraulically connected aquifer.

The shallow water-bearing zone occurs at or near the ground surface throughout the site. This zone varies in thickness from 0 feet at monitoring well 6 (MW-6) to 17 feet at the site margins along the Passaic River. Depth to groundwater occurs at 5 feet below the surface or less. Groundwater flows through this zone, along the top of the glacial lake varved clays, in a northerly direction toward the Passaic River. This shallow zone consists of stratified medium to fine sand, silt, clay, gravel, silty fine sand, and silty clay. The permeability of the unsaturated zone is approximately 10^{-3} - 10^{-5} cm/sec.

The deep water - bearing zone consists of stiff clayey silt, silty sand, and sandy clay with coarse sand and gravel (shale fragments) intermixed. This zone directly overlies competent bedrock and varies in thickness from 2 feet at monitoring well 1 (MW-1) to 6 feet at observation well 1 (OW-1). At the southern end of the site, at monitoring well 7 (MW-7), depth to this zone from the ground surface is approximately 15 feet. At the northern end of the site, at monitoring well 4 (MW-4), depth to this zone from the ground surface is approximately 49 feet. The glacial lake clay deposits that overlay this deep water-bearing zone act as a confining layer; consequently, groundwater in this zone occurs under artesian conditions. This water-bearing zone is thought to occur just below ground surface on a hill approximately 500 feet south of the site. The interconnection between the shallow and deep water-bearing zones could occur at this point. The deep water-bearing zone is believed to be completely saturated most of the time. The depth to groundwater in this zone is believed to be 15 feet at the southern end of the site and approximately 49 feet at the northern end of the site near the Passaic River. The permeability of this zone is approximately 10^{-3} - 10^{-5} cm/sec. Groundwater flow in this deep water-bearing zone is to the northwest. "Reversed head" conditions exist in most, if not all, deep wells on site at one time or another, and may account for the observations of certain compounds occuring at higher concentrations in upgradient deep wells as compared to downgradient deep wells.

In the shallow aquifer, observation wells 1 and 4, (OW-1, OW-4), are upgradient wells, and observation well 2 (OW-2) and monitoring well 5 (MW-5) are downgradient wells. Analytical results of sampling conducted on March 14, 1984, by Engineering-Science indicated that 1,1,2,2-tetrachloroethane was detected in well OW-2 at a concentration 47 times greater than in well OW-1; 0.47 ppm and 0.01 ppm, respectively. Analytical results of sampling performed by Engineering-Science on November 18, 1985, indicated that 1,2-dichloroethane was detected in well MW-5 at a concentration approximately 11 times greater than in well OW-4; 0.21 ppm and 0.02 ppm, respectively.

In the deep aquifer, observation well 4 (OW-4) is an upgradient well, and observation well 3 (OW-3) and monitoring well 5 (MW-5) are downgradient wells. Analytical lab results of sampling performed by Engineering-Science on November 18, 1985 indicated that trichloroethene was detected in well OW-4 at concentrations approximately eight times greater than in well OW-3; 0.08 ppm and <0.01 ppm, respectively. Analytical lab results of sampling performed by Engineering-Science on June 23, 1986 indicated that trichloroethene was detected in well OW-4 at concentrations 12 times greater than well MW-5; 0.048 ppm and 0.004 ppm, respectively.

From the above information it can be determined that contaminants attributable to the site have contaminated groundwater in the shallow zone aquifer. The observed contamination in the deep zone aquifer is probably not attributable to the site because the intervening glacial lake clays act as an aquaclude and deter downward migration of substances. It has been proposed by Engineering-Science in its report, "Contamination Assesment Report Update, Berkeley Heights, New Jersey" (May 1989), that off-site sources may be contributing to the groundwater contamination in the deep-zone aquifer. The possible source of these contaminants would be a former dump/landfill site located on Union County park land immediately adjacent to the southwest corner of the plant site. The annual net precipitation for this area is approximately 15 inches.

There are private wells located in Berkeley Heights and New Providence Townships. Approximately 12 to 15 wells in Berkeley Heights may be used for drinking water by residents. The location of these wells, their depth, and which aquifer they withdraw water from are not known. It is thought that the private wells in New Providence are used mainly for irrigation of lawns, etc. The population served by private wells in this area is unknown. There are two public supply wells within a 3-mile radius of the site. One well, located in Stirling, only serves approximately 20 residents of the town. It is not known what aquifer the well withdraws water from. Its depth is also not known. The second well is owned by the Watchung Hills Regional High School. This well is used for irrigation purposes on the school grounds. It is also not known what aquifer the well withdraws water from, or what its depth is. One selected private well in Berkeley Heights is used for drinking water. This well withdraws water from the Upper Triassic; depth to groundwater is 1 ft below the ground surface. Three selected private wells in New Providence are used for drinking water. One well, No. 2, withdraws water from the Brunswick Formation; the depth to groundwater is 30 ft.

Groundwater contamination exists in the shallow-zone aquifer and can be attributable to the clear Water Lagoon (CWL), Product Storage Area (PSA), and the Dredged Material Disposal Area (DMDA). The groundwater contamination can be attributed to the waste units because they were unlined/poorly contained areas. The population that would be affected by this groundwater contamination is unknown, but would include any people using public or private wells for drinking water where the wells are located downgradient of the site, and in or adjacent to the Passaic River

Floodplain. In addition the wells would have to be withdrawing water from the shallow aquifer zone.

Ref. Nos. 2; 3; 9, pp 3.1-3.14, 4.1-4.15, 6.1-6.28; 12; 13; 14; 15; 19; 20; 21

2.4 SURFACE WATER ROUTE

The Millmaster Onyx site is located on the south bank of the Passaic River. Elevation topography at the site indicates a slope to the north of less than 3 percent. Facility elevations range from a high of 218 feet Mean Sea Level (MSL) to a low of 212 feet MSL. The slope of the northern site boundary to the Passaic River varies from a low of 5.38 percent by the DMDA to a high of 36 percent by the PSA. The surface water migration pathway off site would be in a north to northwest direction towards the Passaic River. The site is not located in the floodplain of the Passaic River nor is it in a 100-year flood zone. The 1-year 24-hour rainfall value for this area is 2.8 inches.

The Passaic River is the downslope surface water shown to be contaminated by substances attributable to the site. The Passaic River is less than 100 feet north of the site by the PSA and CWL. Analytical results of river sediment samples collected near the PSA and CWL on September 18, 1985 showed detection of PCBs and base/neutral extractables. A sediment sample from the Passaic River next to the PSA indicated the presence of PCBs at a concentration of 5.5 mg/kg. Sediment samples taken 500 feet upstream and downstream of the PSA showed lower concentrations of PCBs; the concentrations were below detection limit and 0.40 mg/kg, respectively. The PCB contamination in the river sediment is attributed to the transport, by surface water runoff from the site, of PCB-contaminated soil. In reference No. 9, refer to the executive summary on pages 1 through 5, and to the description of contamination of off-site areas on pages 5-53 through 5-82 for the basis of the statement made in the previous sentence. Also, on this same date, analytical results of Passaic river sediment samples taken adjacent to the CWL indicated the presence of Benzo(b + k)-fluoranthene, at a concentration of 0.20 mg/kg. Passaic River sediment samples taken 500 feet upstream and downstream of the CWL showed lower concentrations of Benzo(b + k)-fluoranthene upstream and higher concentrations downstream; the concentrations were 0.20 mg/kg and 0.80 mg/kg, respectively.

The Passaic River is designated to be used for potable supply after proper treatment, recreational, industrial, and agricultural purposes along the 3 miles upstream and downstream of the site. There are no other water bodies located along the surface water migration pathway within 3 miles upstream or downstream of the site. There are no known freshwater wetlands or critical habitats of federally-listed endangered species within 1 mile of the site along the surface water migration pathway. There are no coastal wetlands within 2 miles of the site along the surface water migration pathway, as the area is not of a coastal nature The New Jersey/American Water Company uses two surface water intakes along the Passaic River, however, these intakes are located 4.1 miles downstream from the site near the Canoe Brook Reservoirs numbers 1 and 2.

The Clear Water Lagoon (CWL) was an unlined surface impoundment adjacent to the Passaic River. Surface water contamination is attributable to this waste unit because of its proximity to the Passaic River, its unlined nature, and the moderate slope between the waste unit and the Passaic River.

The Product Storage Area (PSA) contained approximately 14 above-ground storage tanks used to store solvents. It is believed that spills of solvents during their transfer to or from the tanks had contributed to surface water contamination. The PSA is located adjacent to the Passaic River and exhibits a moderate slope from the waste unit to the river. Seeps emanating from the river bank by the PSA have contributed to surface water contamination.

The Dredged Material Disposal Area (DMDA) is located in the northwest corner of the site and adjacent to the Passaic River. No surface water contamination has been attributed to this waste unit. However, there is a potential for surface water contamination attributable to this waste unit to occur due to its proximity to the river and the effects of surface water runoff during periods of heavy rainfall and resultant high river water levels.

The other waste units, the Temporary Soils Storage Area (TSSA), the north and south chemical lagoons (NCL and SCL), the Chemical Sewer Lagoon (CSL), and the PCB spill area by the former Building No. 5 all represent little potential for surface water contamination. This is due to the condition that the site slope at these areas is so small that no surface water migration pathway would exist between the waste units and the Passaic River.

Ref. Nos. 2; 3; 9, pp. 1-5, 5.53-5.82, Appendix L; 10; 11; 12; 13; 14; 15; 16; 17; 18

2.5 AIR ROUTE

No readings above background were detected in the ambient air on the OVA or HNu prior to distrubance of the waste sources during the site inspection conducted on August 17, 1989.

Elevated readings, greater than 1000 ppm, were detected on the OVA and HNu while conducting air monitoring directly at the opening of a vent pipe used during the vacuum extraction test at the Clean Water Lagoon. No readings above background were detected in this area when the air monitoring instruments were moved approximately 10 feet away from the vent pipe opening. On March 29, 1978, an overflow of 2,2-dichlorovinyl occured in the former building No. 1; odors emanating from the building resulted in numerous complaints from area residents. No historic landmark is within view of the site.

Ref. No. 1

2.6 ACTUAL HAZARDOUS CONDITIONS

No other actual hazardous conditions pertaining to human or environmental contamination have been documented. Specifically:

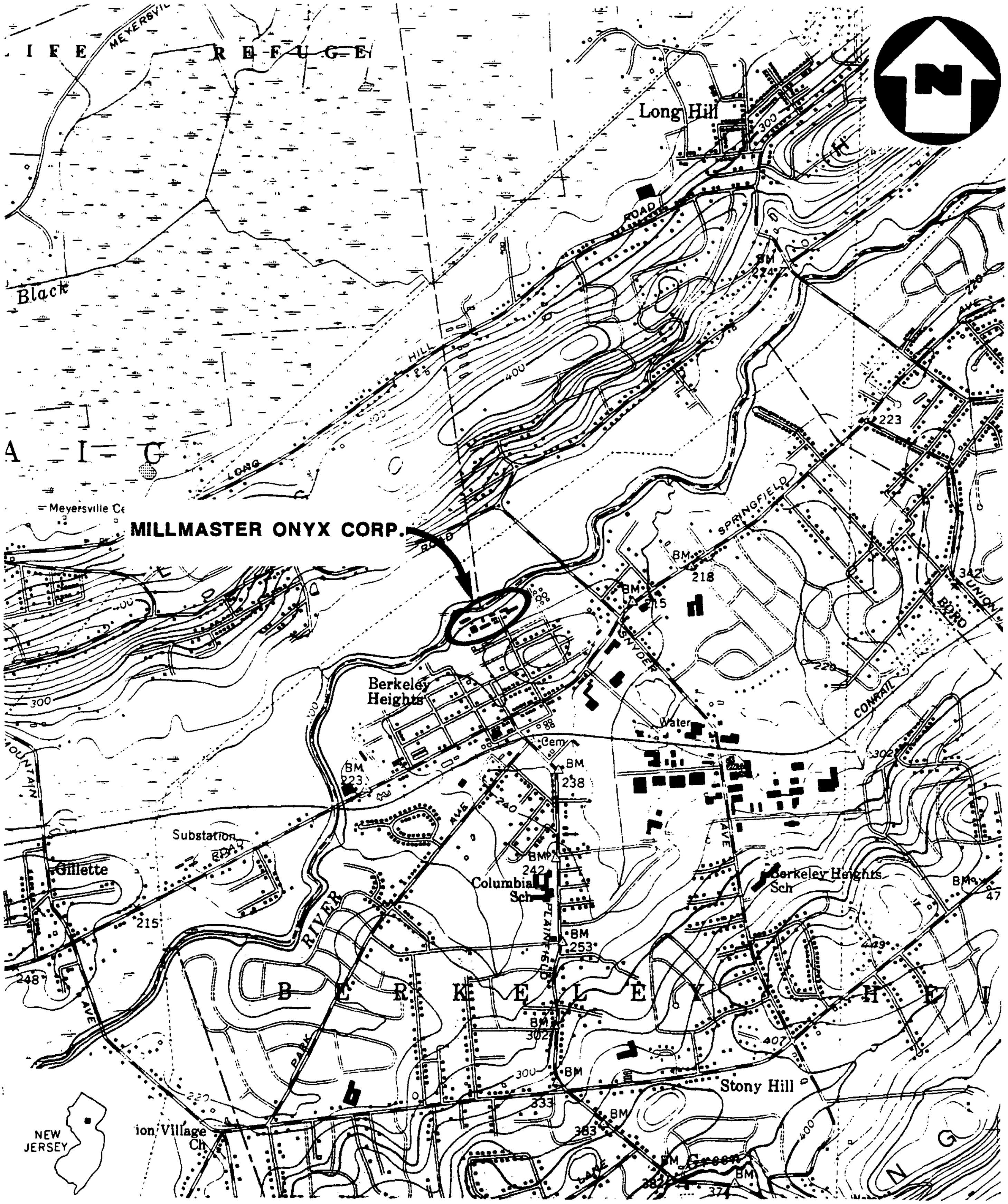
- Contamination has not been documented either in organisms in a food chain leading to humans or in organisms directly consumed by humans.
- There have been no documented observed incidents of direct physical contact with hazardous substances at the facility involving a human being (not including occupational exposure) or a domestic animal.
- There have been no documented incidents of damage to flora (e.g., stressed vegetation) or to fauna (e.g., fish kill) that can be attributed to the hazardous material at the facility.
- There is no documented contamination of a sewer or storm drain without a point source to which the contamination can be attributed.
- Based on field observations, there is no significant threat of fire or explosion.

Ref. Nos. 1-22

3.0 Maps and Photos

MILLMASTER ONYX CORPORATION
BERKELEY HEIGHTS, NEW JERSEY

CONTENTS



(QUAD) CHATHAM, N.J.

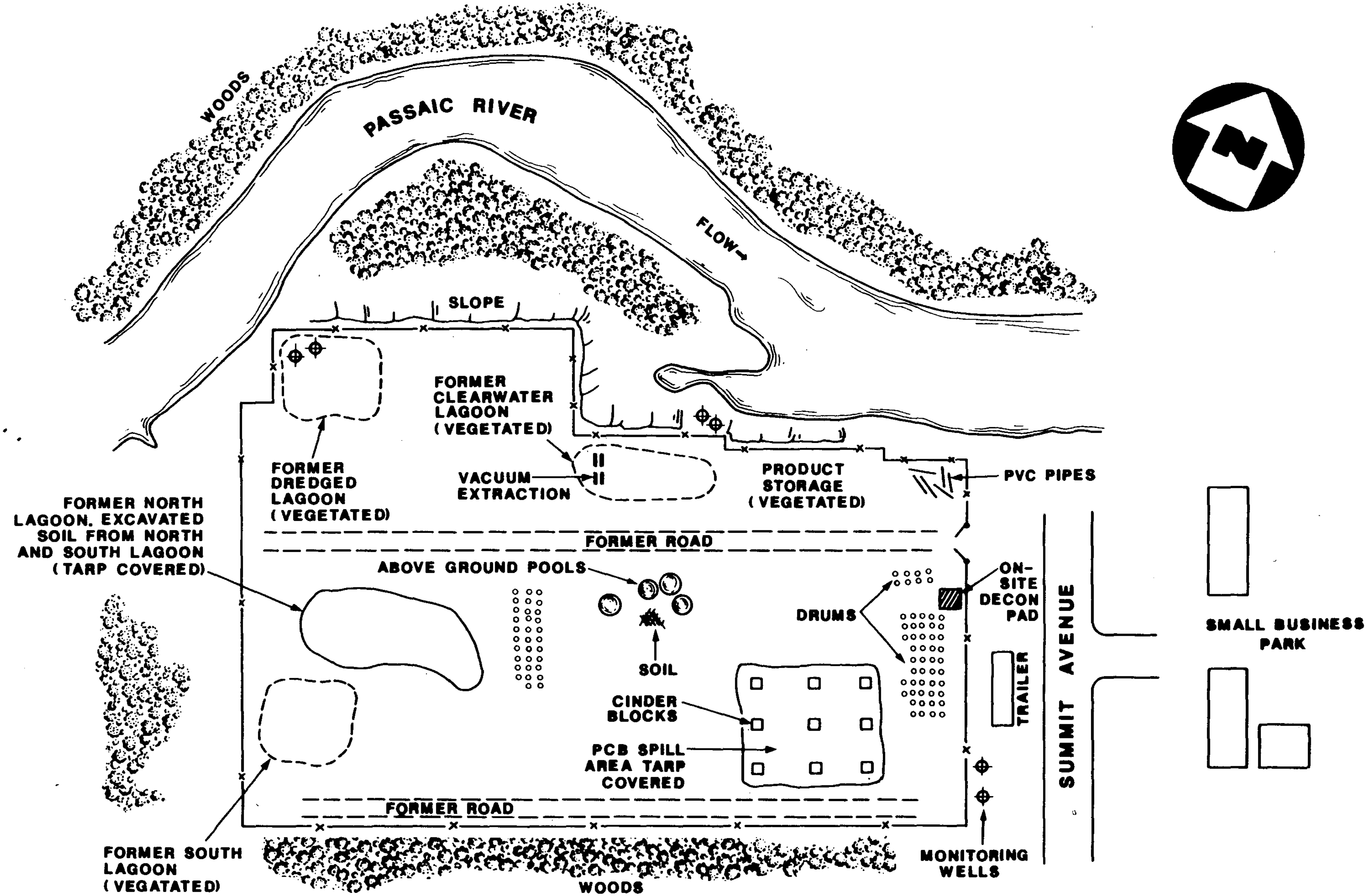
FIGURE 1

SITE LOCATION MAP

MILLMASTER ONYX CORP., BERKELEY HEIGHTS, N.J.

SCALE: 1"= 2000'

NUS CORPORATION



02-8907-35-SI
Rev. No. 0

FIGURE 2

NUS CORPORATION

SITE MAP

MILLMASTER ONYX CORP., BERKELEY HEIGHTS, N.J.

NOT TO SCALE

EXHIBIT A
PHOTOGRAPH LOG

MILLMASTER ONYX CORPORATION
BERKELEY HEIGHTS, NEW JERSEY

SITE INSPECTION: AUGUST 17, 1989

MILLMASTER ONYX CORPORATION
BERKELEY HEIGHTS, NEW JERSEY
AUGUST 17, 1989

PHOTOGRAPH INDEX

ALL PHOTOGRAPHS TAKEN BY EDMUND KNYFD, JR., ON AUGUST 17, 1989

Photo Number	Description	Time
1-P1	Looking northeast at old Product Storage Area.	0955
1-P2	Looking northwest at vacuum extraction area at the Clear Water Lagoon.	1000
1-P3	Looking northwest at 2 monitoring wells in the approximate area of the Dredged Material Disposal Area.	1005
1-P4	Looking south/southwest at tarp covered Temporary Soils Storage Area.	1010
1-P5	Looking north/northeast at empty, rusted drums along the east edge of the Temporary Soils Storage Area.	1015
1-P6	Looking north/northwest at the former South Chemical Lagoon area (in the foreground).	1020
1-P7	Looking north/northeast at former building No. 5/PCB spill explosion area (tarp covered).	1025
1-P8	Looking south/southeast at approximately 50 drums storing new and used charcoal used during the vacuum extraction test.	1032
1-P9	Looking north/northeast from the former Clear Water Lagoon to the Passaic River and approximate 20% slope to the river.	1040
1-P10	Looking north/northeast at 2 monitoring wells outside the north fence line by the Clear Water Lagoon.	1041
1-P11	Looking south at 3 of 4 pools used to hold withdrawn groundwater from the Clear Water Lagoon area during the vacuum extraction test.	1045
1-P12	Looking south at 4th pool. Same description as for photo number 1-P11.	1045

MILLMASTER ONYX CORPORATION, BERKELEY HEIGHTS, NEW JERSEY

1-P1 August 17, 1989 0955
Looking northeast at old Product Storage Area.

1-P2 August 17, 1989 1000
Looking northwest at vacuum extraction area at the Clear Water Lagoon.

MILLMASTER ONYX CORPORATION, BERKELEY HEIGHTS, NEW JERSEY

1-P3 August 17, 1989 1005
Looking northwest at 2 monitoring wells in the approximate area of the Dredged Material Disposal Area.

1-P4 August 17, 1989 1010
Looking south/southwest at tarp covered Temporary Soils Storage Area.

MILLMASTER ONYX CORPORATION, BERKELEY HEIGHTS, NEW JERSEY

1-P5 August 17, 1989 1015
Looking north/northeast at empty, rusted drums along the east edge of the Temporary Soils Storage Area.

1-P6 August 17, 1989 1020
Looking north/northwest at the former South Chemical Lagoon area (in the foreground).

MILLMASTER ONYX CORPORATION, BERKELEY HEIGHTS, NEW JERSEY

1-P7 August 17, 1989 1025
Looking north/northeast at former building No. 5/ PCB spill explosion area (tarp covered).

1-P8 August 17, 1989 1032
Looking south/southeast at approximately 50 drums storing new and used charcoal used during the vacuum extraction test.

MILLMASTER ONYX CORPORATION, BERKELEY HEIGHTS, NEW JERSEY

1-P9 August 17, 1989 1040
Looking north/northeast from the former Clear Water Lagoon to the Passaic River and approximate 20% slope to the river.

1-P10 August 17, 1989 1041
Looking north/northeast at 2 monitoring wells outside the north fence line by the Clear Water Lagoon.

MILLMASTER ONYX CORPORATION, BERKELEY HEIGHTS, NEW JERSEY

1-P11 August 17, 1989 1045
Looking south at 3 of 4 pools used to hold withdrawn groundwater from the Clear Water Lagoon area during the vacuum extraction test.

1-P12 August 17, 1989 1045
Looking south at 4th pool. Same description as for photo number 1-P11.

4.0 SITE INSPECTION SAMPLING RESULTS

No samples were collected during the NUS Corporation Region 2 FIT site inspection conducted on August 17, 1989, as sufficient analytical data exist to accurately assess the site without collecting additional samples. Section 2.1 presents a summary of monitoring and observation well samples collected in 1983. Please refer to the following references for a complete sampling history of the site.

Ref. Nos. 7; 8; 9, pp. 51-5.97, Appendix H

5.0 CONCLUSIONS AND RECOMMENDATIONS

Since approximately 1982, the Millmaster Onyx site has been subject to the monitoring and identification of hazardous waste sources on site, and the resulting effect to the surrounding environment, both on and off site. Gulf Oil, and now Chevron Chemicals Company, the current owner of the site, has been working in conjuction with the New Jersey Department of Environmental Protection, Responsible Party Cleanup Element to come up with an approved RI/FS work plan for remediation of the on-site and off-site hazardous waste contamination.

Chevron Chemicals Company has retained the services of a consultant, Engineering-Science Inc., to conduct a thorough site investigation and propose a suitable plan for remediation of hazardous waste contamination attributable to the site. Results of this investigation have determined that the soils and shallow-zone aquifer on site have been contaminated with PCBs, VOCs, and various base/neutral compounds. Additionally, several off-site areas have been determined to be contaminated with PCBs and VOCs. These areas are immediately adjacent to the site along the east fenceline, the southeast fenceline, the west fenceline, and the northeast fenceline.

The contamination routes of major concern include the shallow-aquifer zone, which flows underneath the site to the Passaic River in a north to northwest direction, and the surface water migration pathways that run off the site to the Passaic River from the Dredged Material Disposal Area (DMDA), the Clear Water Lagoon (CWL), and the Product Storage Area (PSA).

The Millmaster Onyx site was involved in a dioxin study under the direction of the NJDEP to determine potential dioxin contamination at the site resulting from the use of 2,4,5-and 2,4,6-trichlorophenol, which can contain dioxin impurities. Analytical results of 25 samples showed that only one sample had a detection of dioxin, at a concentration of 0.7 ppb. The NJDEP concluded that the site did not pose a threat to the population or the environment because of dioxin contamination.

Based upon the documented evidence of soil and groundwater contamination attributable to the Millmaster Onyx site, its proximity to the Passiac River, and the location of two surface water intakes 4.1 miles downstream of the site, the site is recommended for **MEDIUM PRIORITY** for further action. However, based on the state's involvement, further action is deferred to the New Jersey Department of Environmental Protection, Responsible Party Cleanup Element, Bureau of State Case Management. The NJDEP has classified the Millmaster Onyx site as a site of High Environmental Concern (HEC). It is also recommended that the case manager periodically inform the U.S. EPA of the current status of the remediation efforts at the site.

Ref. Nos. 1-22

6.0 REFERENCES

1. Field Notebook No. 0456, Millmaster Onyx Corporation, TDD No. 02-8907-35, Site inspection, NUS Corp. Region 2 FIT, Edison, New Jersey, August 17, 1989.

2. General Sciences Corporation, Graphical Exposure Modeling Systems (GEMS). Landover, Maryland, 1986.

3. Uncontrolled hazardous waste site ranking system, A user's manual, 40 CFR, Part 300, Appendix A, 1986.

4. Technical Report for Gulf Oil and Chemical, TCDD Data Report. Environmental Testing and Certification, July 13, 1983.

5. Technical Report for Gulf Oil and Chemical, TCDD Data Report. Environmental Testing and Certification, July 18, 1983.

6. Sampling Program at Berkeley Heights Site and Recommended Dioxin Testing, Berkeley Heights, New Jersey. Weston-Designers, Consultants circa June 1983.

7. Public Statement by Commissioner Robert E. Hughey for Millmaster Onyx/Gulf Chemical site in Berkeley Heights, New Jersey, July 14, 1983.

8. Letter from Robert E. Hughey, Commissioner, New Jersey Department of Environmental Protection, to Edward B. Walker III, President, Gulf Oil and Chemical Co., June 3, 1983.

9. Contaminant Assessment Report Update, Berkeley Heights, New Jersey, Engineering-Science, Inc., May 1989.

10. U.S. Department of Housing and Urban Development, Federal Insurance Program, Flood Insurance Rate Map, Township of Berkeley Heights, New Jersey, Union County, Community-Panel Number 340459 0001 B, March 1, 1978.

11. U.S. Department of the Interior, Geological Survey Topographic Map, 7.5 minute series, "Chatham Quadrangle, NJ", 1955, revised 1981; "Bernardsville Quadrangle, NJ", 1954, revised 1981.

12. Telecon Note: Conversation between secretary of Town Engineer, Township of Berkeley Heights, and Edmund Knyfd Jr., NUS Corp , September 12, 1989.

6.0 REFERENCES CONT'D

13. Telecon Note: Conversation between Town Engineer, Town of New Providence, and Edmund Knyfd Jr., NUS Corp., September 12, 1989.

14. Telecon Note: Conversation between Paul Hartelius, engineer, New Jersey/American Water Company (Northern Division), and Edmund Knyfd Jr., NUS Corp., September 12, 1989.

15. Telecon Note: Conversation between Jack Flood, Plumbing Inspector, Township of Berkeley Heights, and Edmund Knyfd Jr., NUS Corp., September 13, 1989.

16. Department of the Interior, U.S. Fish and Wildlife Service, Atlantic Coast Ecological Inventory, Newark, NJ-NY-PA, 1980.

17. State of New Jersey Department of Environmental Protection, Division of Water Resources, Surface Water Classifications, Surface Water Quality Standards N.J.A.C. 7:9-4, May 1985.

18. State of New Jersey Department of Environmental Protection, Division of Water Resources, Surface Water Quality Standards, N.J.A.C. 7:9-4.1 et seq., May 1985.

19. Telecon Note: Conversation between Paul Hartelius, Engineer, New Jersey/American Water Company, and Edmund Knyfd Jr., NUS Corp., September 18, 1989.

20. Telecon Note: Conversation between Dr. Sable, Watchung Hills Regional High School - Board of Education, and Edmund Knyfd Jr., NUS Corp., September 18, 1989.

21. Geology and Ground-Water Resources of Union County, New Jersey. U.S. Geological Survey Water-Resources Investigations 76-73, June 1976.

22. Millmaster Onyx/Gulf Oil Site Assessment, author unknown, date unknown (circa 1983?).

REFERENCE NO. 1

NUS CORPORATION

II

0456

MILLMASTER ONYX CORP.
02-8907-35
TDD MGR- E. KNYFD
LOGBOOK # 0456
AUGUST 17, 1989

... which can be used to locate photo or sample locations. Note landmarks, indicate north, and if possible include an approximate scale. Draw as many sketches and maps as necessary.

- Record any other relevant information which would be difficult to generate at a later date.

GUIDANCE FOR PROPER USE OF LOG BOOKS

Purpose

- Serves to document onsite activities and be understandable to an outside reader.
- Provides the basis for later written reports.
- Used as an evidentiary document and may be used in legal proceedings.

Distribution

- Controlled by the project manager and distributed as appropriate to personnel designated by the project manager.

General Procedures

- Record information in language which is objective and factual.
- Use ink. Waterproof ink is recommended.
- Leave first two pages blank. They serve as space for the table of contents to be added when the log book is complete.
- The first written page identifies the date, time, TDD number, site name, location, NUS personnel and their responsibilities, other non-NUS personnel and observed weather conditions.
- Start on a new page at the start of each day's field activities. This page should identify date, time, TDD number, site name and location, NUS personnel and their responsibilities, other non-NUS personnel and observed weather conditions.
- List all persons leaving or entering the site.
- Information recorded in the log book should be in chronological order.
- Sign and date each page, log all entries using a 24 hour clock. Entries should be time logged every 15 to 30 minutes.
- Corrections are to be lined through and initialed. No erroneous notes are to be made illegible.
- Include a sketch or map of the site which can be used to locate photo or sample locations. Note landmarks, indicate north, and if possible include an approximate scale. Include as many sketches and maps as necessary.
- A person not present when field activities were being documented should read each completed page, and countersign and date when satisfied that the written notes are understandable.

Specific Field Activities To Be Documented

- Record the who, what and where of field activities.
- Indicate sampling and photo locations on a site sketch or map.
- As part of the chain of custody procedure, recorded in-situ sampling information must include sample number, date, time, sampling personnel, sample type, designation of sample as a grab or composite, and any preservative used.
- Information for in-situ measurements must include a sample ID number, the date, time, and personnel taking measurements. Pertinent in-situ measurements include but are not limited to pH, temperature, conductivity, flow measurements, continuous air monitoring measurements, and stack gas analysis. If infield calculations are necessary they must be checked and signed by a second team member.
- Create a photo log to document photos taken in the field. These must include date, time, photographer, sample number, roll number, frame number, photo ID number and description. Indicate if the film is for slides or prints in the column for roll number. Photo ID numbers can be added at the time the photo log is assembled.
- Record onsite health and safety measures used. Describe observed potential hazards to health and safety. Document the level of protection used, decontamination procedure used and specific decontamination solutions.
- When sampling is complete, a summary log is to be completed. It must include date, time, sample number, description, field book reference page, and the number and date of the chain of custody from on which the sample is listed. Indicate whether or not the sample was split.
- Record details regarding relevant information obtained during onsite interviews. Include names of persons interviewed, the interest group represented, their address and phone number.
- Record any other relevant information which would be difficult to generate at a later date.

8/17/89 02-8907-35

MILLMASTER ONYX CORP.

Table of Contents

DAVID G. JOHNSON, P.E.
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INDUSTRIAL WASTE GROUP

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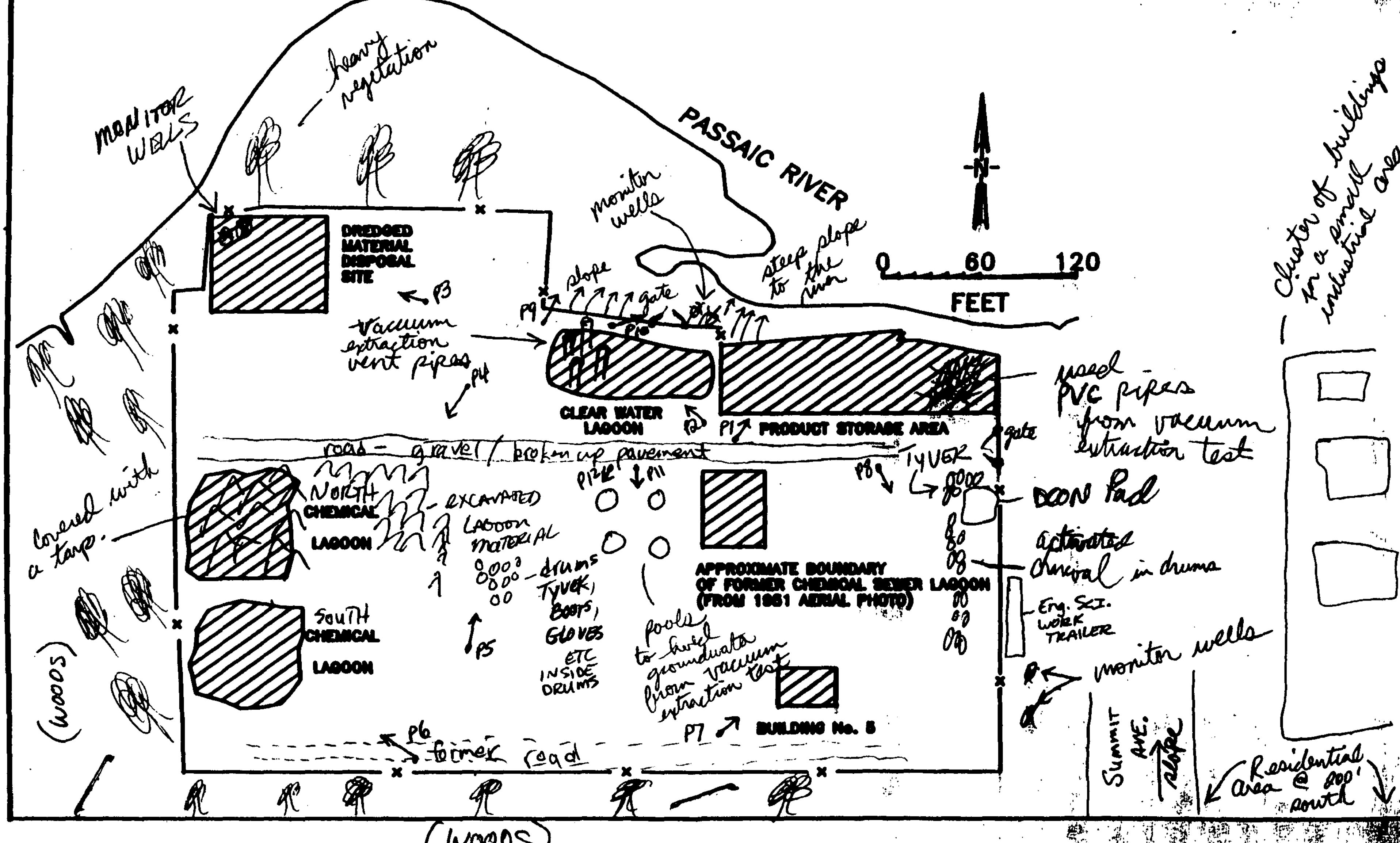
Chevron

Chevron Chemical Company
6001 Bollinger Canyon Road, San Ramon, California
Mail P.O. Box 5047, San Ramon, CA 94583-0947
Phone (415) 842-5890

Steven G. Raatz
Senior Facilities Planning Engineer
Environment & Health Protection

FIGURE 5.1

CONTAMINATION SOURCES



ES ENGINEERING-SCIENCE

SHG:SHG:

8/17/89 02-8907-35 0828

MILLMASTER ONYX CORP. - PERFORM AN ON-SITE RECONNAISSANCE

11 SUMMIT AVE

BERKELEY HEIGHTS TWP., NJ

E Knypl 8-17 Ed Knypl - SITE MANAGER - WRITTEN & PHOTOGRAPHIC DOCUMENTATION

DH 8-17 DAVE HEIM - SITE SAFETY OFFICER - AIR MONITORING

SH 8-17 STEVE HERRICK - SURVEILLANCE / BACKUP

TIME 0830 - Dave Heim gave the site safety meeting in the suburban on the way to the site.

TIME 0930 Arrived on site and met with Steve Racity of Chevron Chemicals Company and David Johnson of Engineering-Science Inc of Syracuse, NY.

Steve Racity and David Johnson are dressed in Tyvek, boots and gloves, but no respiratory protection.

Weather conditions are 80°F, sunny, and a slight breeze to the west 0-5 mph.

D Heim 8/23/89

Edmund Knypl Jr. 8-17-89

8/17/89 0935 02-8907-35

McMASTER ONYX CORP.

Radiation background = 16 cpm EPA # 428522

OVA background = 0 EPA # 428696

HNu background = 0 EPA # 192120

Chinon CP-6 camera (slides) EPA # 469772
Canon AE-1 camera (prints) EPA # 307127

Time 0950 Entered site on level C. Facility slope appears to be less than 3% and possibly less than 1%.

0955 1-P1 photo NE towards the product storage area.

As we entered the site the soil and surface was noted to be very wet, mossy in areas, heavily vegetated, gravelly with broken concrete slabs.

0958 OVA reading was ~~pegged on all scales~~ > 1000 ppm E.K. 8-24-89 at the vacuum extraction system in the Clearwater lagoon. the HNu also ~~pegged~~ E.K. 8-24-89 ~~on all scales~~ showed readings > 1000ppm DA 8/24/89. The readings were taken at the opening of a vent pipe of the system.

Elmund Kopl Jr.
8-17-89

8/17/89 0959 02-8907-35
MILLMASTER ONYX CORP.

1000 1P-2 Picture of vacuum extraction system and ~~clearwater~~ clearwater lagoon looking NW. E.K. 8-17-89

note: Print camera malfunctioned; all pictures will be on the slides camera.

1005 1P-3 Picture of monitor wells in approximate area of dredged material dumping site. (Some dredged/sludge material from the north and south chemical lagoons was thought to have been deposited here.)

1010 1P-4 Picture of tarp-covered excavation material from chemical lagoons north and south and drums on site, which contain tyvek suits, boots and gloves and some sampling material from previous site work. Some of the drums are empty.

Edmund Knyfd Jr.
8-17-89

D. Hessom 8/23/89

1015

1020

David Johnson and Steve Raatz indicated that it is believed that the PCB spill occured somewhere near building 5, most ~~likety~~ E.K. 8-17-89 likely in the piping system of the hot-oil heat exchanger. 1025 1027

D. Hessin 8/23/89

Elmund Kngbelj. 8-17-89

8/17/89 1014 02-8907-35
MILLMASTER ONYX CORP.

1015 1P-5 looking N-NE past empty/rusted drums next to excavated material.

Steve Raatz mentioned that excavated material is deposited on top of concrete slabs.

1020 1P-6 Picture looking N-NW ~~of~~ at EK 8-17-89 South Chemical lagoon (formerly).

1025 1P-7 Picture of area where PCB spill took place. The ~~approx~~ EK 8-17-89 location of the exact spill is approximate, not known, but in this area.

1027 Went to level D in this area because it was covered. will remain on level D for the rest of the recon.

Elmer C. Kopf Jr.
8-17-89

D. Hessen
8/23/89.

103

Steve Raatz and David Johnson said that 104
it was thought that the site was
filled in with fill to make the site
elevation higher than the Passaic River
(10-20 ~~ft~~ higher). Land on the north
side of the Passaic River ~~was~~ is at 1041
E.K. 8-17-89
an elevation closer to that of the river.
David Johnson also mentioned that the
site was not within a 100-year flood 1045
zone of the Passaic River.

D. Hessemer
8/23/89

[illegible] Jr.
8-17-89

8/17/89 1031 02-8907-37
MILLMASTER ONYX CORP.

1032 1P-8 Picture of drums containing used and new activated charcoal used in the vacuum extraction process.

Some drums are in good condition, some are rusted - about 50 drums total.

1040 1P-9 Picture down an approx. 20% slope looking N from the site to the Passaic River (at edge of clearwater lagoon).

1041 1P-10 Picture of 2 monitor wells just outside of N fence by Clearwater lagoon.

1045 1P-11 Picture of 3 above-ground pools used to hold groundwater withdrawn to conduct the vacuum extraction test. Steve Rantz and David Johnson indicated that Chemical Waste of Newark was contracted to manifest this groundwater off-site for proper disposal.

D. Hessman 8/23/89

Edmund C. Kopf Jr.
8-17-89

8/17/89 1045 02-8907-37

MILLMASTER ONYX CORP.

1045 1P-12 Picture of the 4th pool used in storing/holding groundwater for vacuum extraction test. Chemical Waste of Newark also manifested this groundwater off site for proper disposal.

1050 Ended the recon and started to decon.

1105 Left site.

Edmund Kupfel Jr. 8-17-89

D Hessman 8/23/89

8-17-89 02-8907-35

Millmaster Onyx Corporation (Berkeley Heights)
Site Inspection

Photograph Log
(all photos taken by E. Knyfel)

Photo #	Time	Description
1-P1	0955	Looking NE at old product storage area.
1-P2	1000	Looking NW at Vacuum extraction installed for a test in the Clearwater lagoon.
1-P3	1005	Looking NW at 2 monitor wells in the approximate area of dredged material dumping site.
1-P4	1010	Looking S-SW at tarp covered excavation material from the north and south Chemical lagoons.
1-P5	1015	Looking N-NE at some of the empty/rusted drums on the east edge of the excavated north and south lagoon material.

D. Hessem
8/23/89

Elmund Knyfel Jr.
8-17-89

8-17-89 02-8907-35

Millmaster Onyx Corporation (Berkeley Heights Twp.)
Site Inspection

Photograph Log
(all photos taken by E. Krypel)

photo #	Time	Description
1-P6	1020	Looking N-NW at the former south chemical lagoon.
1-P7	1025	Looking N-NE at former building 5 area where PCB spill took place; area now covered with a tarp held down by cinder blocks.
1-P8	1032	Looking S-SE at approx 50 drums containing new and used charcoal used in the vacuum extraction test performed at the Clearwater lagoon.
1-P9	1040	Looking N-NE from Clearwater lagoon to Passaic River and approx 20% slope off facility to the river.

D Hessum 8/23/89 Edmund Krypel Jr. 8-17-89

8-17-89 02-8907-35

Millmaster Onyx Corporation (Berkeley Heights Twp.)

Site Inspection

Photograph Log
(all photos taken by E. Knyfd)

Photo #	Time	Description
1-P10	1041	Looking N-NE at 2 monitoring wells just outside of the north fence by the Clearwater lagoon.
1-P11	1045	Looking south at 3 of 4 above-ground pools used to hold groundwater pumped out of the ground during vacuum extraction test at the Clearwater lagoon.
1-P12	1045	Looking south at the 4th pool used to hold groundwater during vacuum extraction test at the Clearwater lagoon.

D. Hessen
8/23/89

Edmund Knyfd Jr.
8-17-89

REFERENCE NO. 2

GSC-TR8645

GRAPHICAL EXPOSURE MODELING SYSTEM

(GEMS)

USER'S GUIDE

VOLUME 2. MODELING

Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES AND TOXIC SUBSTANCES
EXPOSURE EVALUATION DIVISION
Task No. 3-2
Contract No. 68Ø2397Ø
Project Officer: Russell Kinerson
Task Manager: Loren Hall

Prepared by:

GENERAL SCIENCES CORPORATION
84Ø1 Corporate Drive
Landover, Maryland 2Ø785

Submitted: December 1, 1986

GEMS> I

MILLMASTER ONYX CORPORATION
LATITUDE 40:41:15 LONGITUDE 74:26:38 1980 POPULATION

KM	0.00-.400	.400-.810	.810-1.60	1.60-3.20	3.20-4.80	4.80-6.40	SECTOR TOTALS
S 1	805	0	3927	15159	13163	36265	69319
RING TOTALS	805	0	3927	15159	13163	36265	69319

GEMS> I

MILLMASTER ONYX CORPORATION
LATITUDE 40:41:15 LONGITUDE 74:26:38 1980 HOUSING

KM	0.00-.400	.400-.810	.810-1.60	1.60-3.20	3.20-4.80	4.80-6.40	SECTOR TOTALS
S 1	244	0	1139	4706	4310	12465	22864
RING TOTALS	244	0	1139	4706	4310	12465	22864

	POPULATION	HOUSING
0.25 MILE	805	244
0.50 MILE	805	244
1.0 MILE	4732	1383
2.0 MILES	19891	6089
3.0 MILES	33054	10399
4.0 MILES	69319	22864

REFERENCE NO. 3

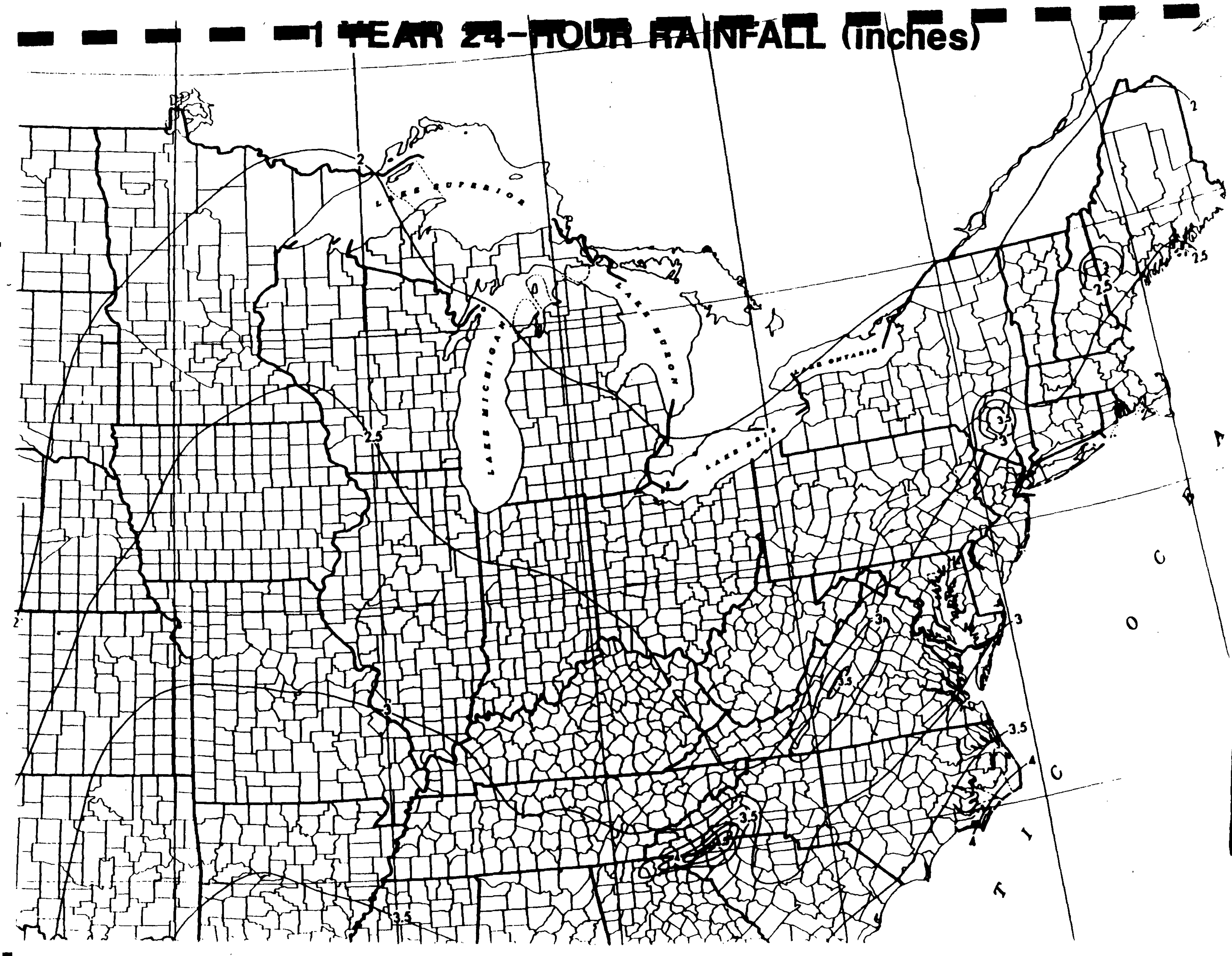
Uncontrolled Hazardous Waste Site Ranking System

A Users Manual
(HW-10)

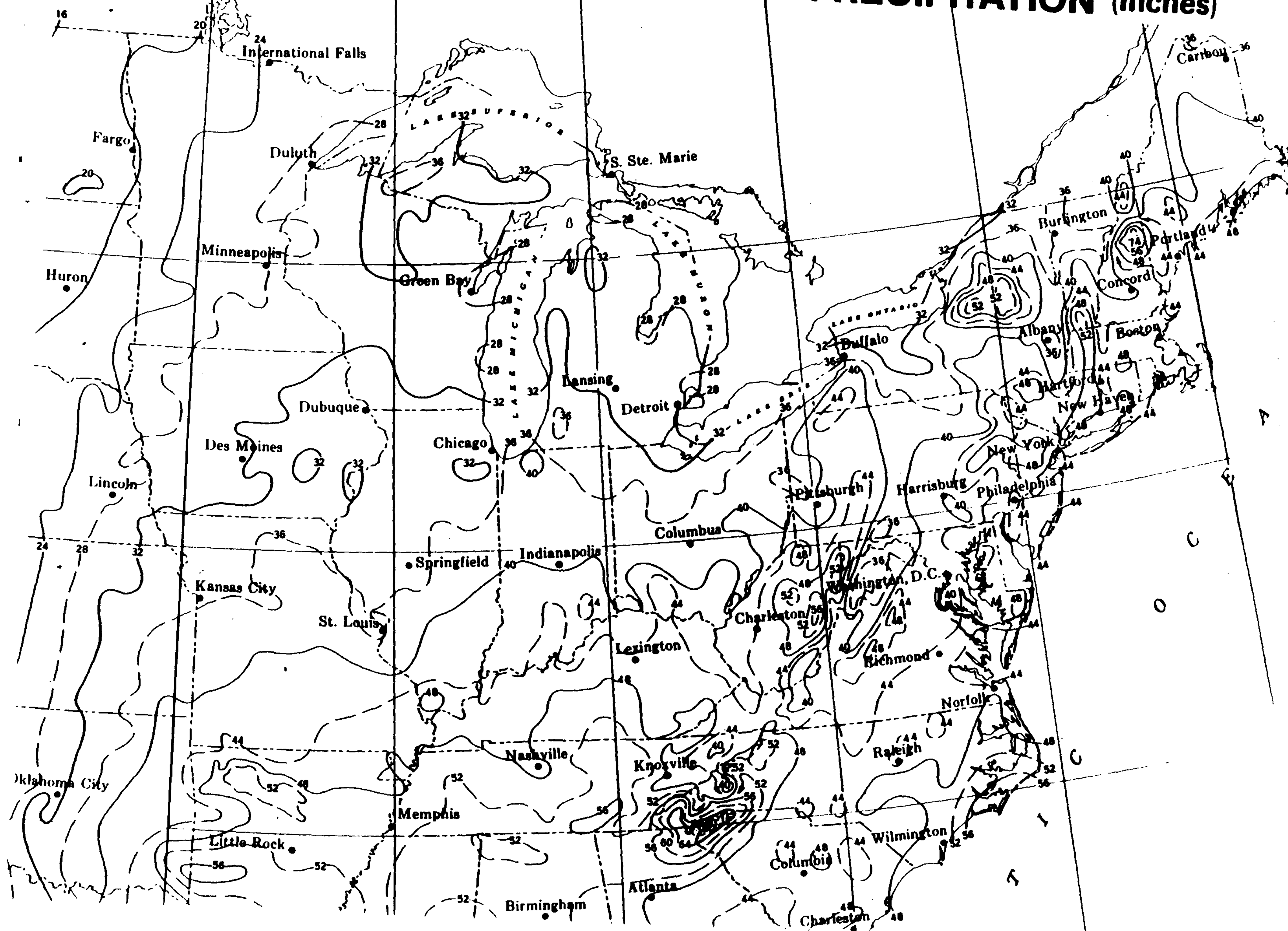
Originally Published in
the July 16, 1982, *Federal Register*

United States
Environmental Protection
Agency

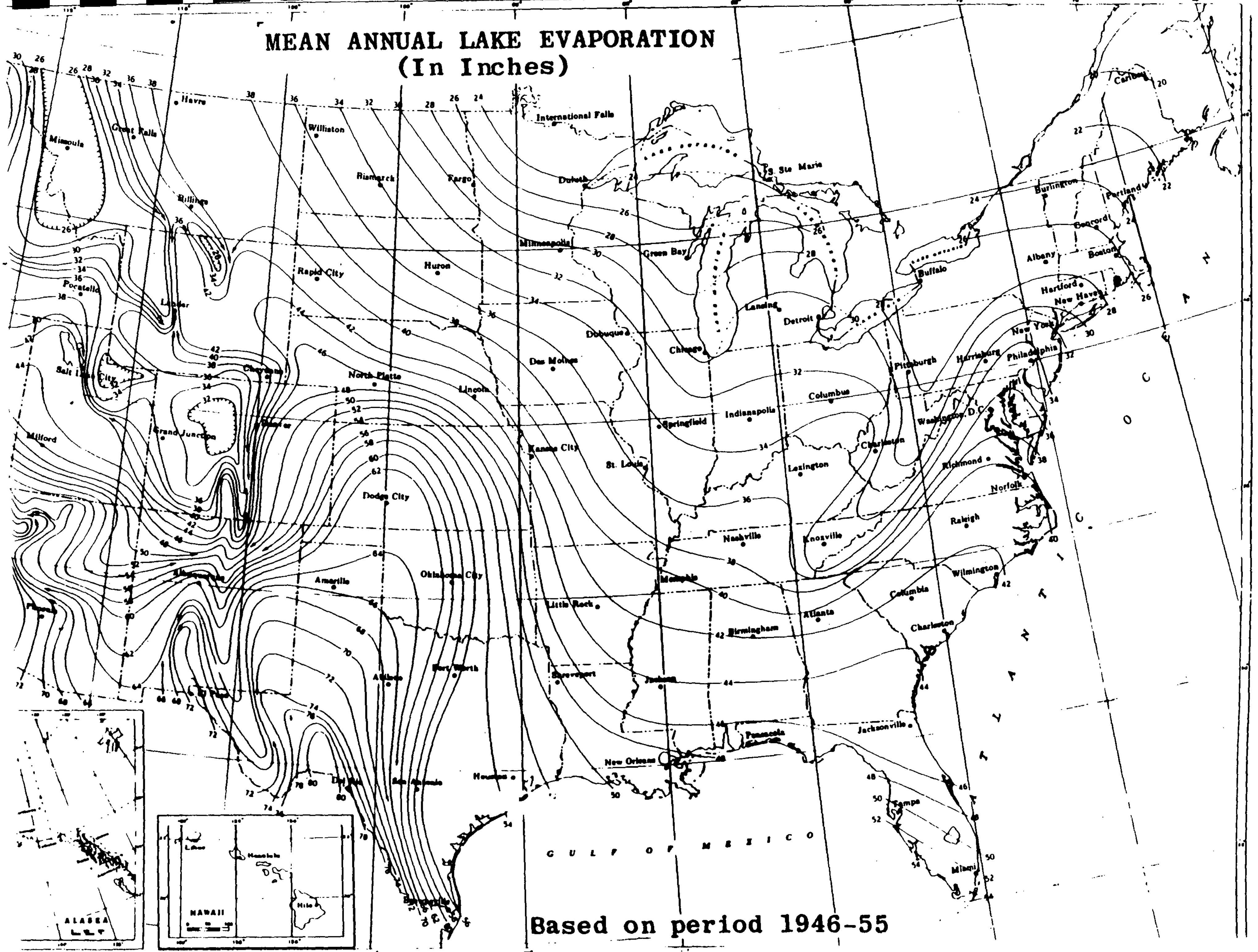
1984


1 YEAR 24-HOUR RAINFALL (inches)
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ONTARIO
LAKE ERIE
ATLANTIC OCEAN
2
2.5
3
3.5
4

NORMAL ANNUAL TOTAL PRECIPITATION (Inches)



MEAN ANNUAL LAKE EVAPORATION
(In Inches)



Based on period 1946-55

TABLE 2

PERMEABILITY OF GEOLOGIC MATERIALS*

Type of Material	Approximate Range of Hydraulic Conductivity	Assigned Value
Clay, compact till, shale; unfractured metamorphic and igneous rocks	$<10^{-7}$ cm/sec	0
Silt, loess, silty clays, silty loams, clay loams; less permeable limestone, dolomites, and sandstone; moderately permeable till	$10^{-5} - 10^{-7}$ cm/sec	1
Fine sand and silty sand; sandy loams; loamy sands; moderately permeable limestone, dolomites, and sandstone (no karst); moderately fractured igneous and metamorphic rocks, some coarse till	$10^{-3} - 10^{-5}$ cm/sec	2
Gravel, sand; highly fractured igneous and metamorphic rocks; permeable basalt and lavas; karst limestone and dolomite	$>10^{-3}$ cm/sec	3

*Derived from:

Davis, S. N., Porosity and Permeability of Natural Materials in Flow-Through Porous Media, R.J.M. DeWest ed., Academic Press, New York, 1969

Freeze, R.A. and J.A. Cherry, Groundwater, Prentice-Hall, Inc., New York, 1979

REFERENCE NO. 4

ETC ENVIRONMENTAL TESTING and CERTIFICATION

July 13, 1983

TECHNICAL REPORT

for

Gulf Oil & Chemical
P.O. Box 3766
Houston, TX 77253

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C5841 to C5850	Gulf Oil & Chemical	GULFNJ-D				

ENVIRONMENTAL TESTING and CERTIFICATION CORPORATION

Denis C K. Lin, Ph.D.
Vice President
Research and Operations

ETC ENVIRONMENTAL TESTING and CERTIFICATION CORPORATION

DENIS C.K. LIN, Ph.D.
Vice President
Research and Operations

July 13, 1983

Mr. Dennis Caputo
Gulf Oil & Chemical
P.O. Box 3766
Houston, TX 77253

Dear Mr. Caputo:

We are pleased to submit the accompanying reports in response to your testing requirements. We are confident that the results are of the highest quality.

If you have any questions regarding your report, we encourage you to contact any one of the following persons in our Client Service organization:

Deb Holton	(201) 225-6742
Pat McIsaac	(201) 225-6751
Janet Zimmermann	(201) 225-6722

They will coordinate your inquiries with the appropriate technical personnel. Your account executives, along with our Client Service organization are also available to assist you in defining requirements for future testing programs.

If we can be of further service to your organization in the future, please contact us.

Sincerely,

Denis C. K. Lin, Ph.D.

DCKL:rp
Attachments

cc: Mr. Tom Burke, NJDEP, Trenton, NJ

TCDD Data Report - Page 1

Lab: ETC Corp.

Date: 07/07/83
GC Column: 60M SP2340

ETC Number	Sample Number	E/C	Grams Wet Weight	ppb TCDD	D.L.	320/322	Surrogate Percent Accuracy	Area 320	Area 322	Area 257	Area 328+	Area 332	Area 334	Comments
MB53-2	MB	J/AD	-	ND	0.05	-	108	-	-	-	1201	1379	1778	
C3392S	QA SPIKE	J/AD	10.00	1.05	-	0.77	116	907	1184	583	2679	2947	3616	
C5818	QA REP	J/AD	10.51	ND	0.11	-	109	-	-	-	1035	1237	1471	
C5818R	QA REP	J/AD	10.53	ND	0.06	-	115	-	-	-	2201	2467	2957	
C5841	RIVER S-16	J/AD	12.00	ND	0.16	-	108	-	-	-	523	545	675	
C5842	DRAINAGE D	J/AD	10.03	ND	0.12	-	88	-	-	-	529	655	865	
C5843	TP-1	J/AD	10.10	ND	0.28	-	100	-	-	-	360	371	539	
C5844	TP-7	J/AD	10.27	ND	0.26	-	92	-	-	-	579	702	886	
C5845	TP-14	J/AD	10.08	ND	0.19	-	92	-	-	-	586	703	910	
C5846	TP-H	J/AD	10.30	ND	0.37	-	84	-	-	-	279	384	458	
C5847	REAR DITCH	J/AD	10.02	ND	0.19	-	93	-	-	-	604	644	939	
C5848	RIVER SA13	J/AD	10.44	ND	0.09	-	94	-	-	-	1308	1478	1907	
C5849	RIVER UPST	J/AD	10.37	ND	0.06	-	95	-	-	-	1434	1639	2025	
C5850	SA34-SA35	J/AD	11.82	ND	0.07	-	103	-	-	-	1838	1877	2456	

+Corrected for contribution by native TCDD (Subtract 0.009 of m/e 322).

MB = Method Blank
P = Partial Scan
N = Native TCDD Spike
D = Duplicate (Intralab)
FB = Field Blank

H = High Resolution
ND = Not Detected
DL = Detection Limit
J = Jar Extraction
S = Soxhlet Extraction

A, B, C,D- Clean Up Option (or any combination)

CALIBRATION SUMMARY

ug/kg* TCDD	Native RRF	DATE	TIME	Surrogate RRF
1.0	0.75	6/20/83	1415 hrs.	0.82
5.0	0.74	6/20/83	1540 hrs.	0.86
25.0	0.70	6/20/83	1625 hrs.	0.87
1.0	0.76	7/06/83	0820 hrs.	0.88
1.0	0.75	7/06/83	1615 hrs.	0.92

* Assumes 10 gram sample.

QUALITY CONTROL SUMMARY

ITEM	# OF DATA POINTS	MEAN ± S.D.
Surrogate Accuracy	23	102+/-10.6
Native TCDD Recovery	1	105%
Method Blank	1	ND
Duplicate Pairs	1	ND
Partial Scan Confirmation	0	Not required; no 2,3,7,8-TCDD detected.

CALIBRATION SUMMARY

ug/kg* TCDD	Native RRF	DATE	TIME	Surrogate RRF
1.0	0.82	7/06/83	0900 hrs.	0.99
5.0	0.80	7/06/83	0935 hrs.	0.98
25.0	0.80	7/06/83	1015 hrs.	1.01
1.0	0.81	7/06/83	0825 hrs.	0.99
1.0	0.86	7/06/83	1600 hrs.	1.03

* Assumes 10 gram sample.

QUALITY CONTROL SUMMARY

ITEM	# OF DATA POINTS	MEAN ± S.D.
Surrogate Accuracy	23	102+/-10.6
Native TCDD Recovery	1	105%
Method Blank	1	ND
Duplicate Pairs	1	ND
Partial Scan Confirmation	0	Not required; no 2,3,7,8-TCDD detected.

Partial Scan Confirmation

ETC Number	Sample Number	Response Ratios 320/324	257/259	194/196	% Relative Abundances* 160	161	194	196	257	259	320	324
-	-	-	-	-	-	-	-	-	-	-	-	-

* Relative to m/e 322.

REFERENCE NO. 5

ETC ENVIRONMENTAL TESTING and CERTIFICATION

July 18, 1983

TECHNICAL REPORT

for

Gulf Oil & Chemical
P.O. Box 3766
Houston, TX 77253

Chain of Custody Data Required for ETC Data Management Summary Reports						
C6335 to C6349	Gulf Oil & Chemical	GULFNJ-D				
ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Time

ENVIRONMENTAL TESTING and CERTIFICATION CORPORATION

Denis C. K. Lin, Ph.D.
Vice President
Research and Operations

ETC ENVIRONMENTAL TESTING and CERTIFICATION CORPORATION

DENIS C.K. LIN, Ph.D.
Vice President
Research and Operations

July 15, 1983

Mr. Denis Caputo
Gulf Oil & Chemical
P.O. Box 3766
Houston, TX 77253

Dear Mr. Caputo:

We are pleased to submit the accompanying reports in response to your testing requirements. We are confident that the results are of the highest quality.

If you have any questions regarding your report, we encourage you to contact any one of the following persons in our Client Service organization:

Deb Holton	(201) 225-6742
Pat McIsaac	(201) 225-6751
Janet Zimmermann	(201) 225-6722

They will coordinate your inquiries with the appropriate technical personnel. Your account executives, along with our Client Service organization are also available to assist you in defining requirements for future testing programs.

If we can be of further service to your organization in the future, please contact us.

Sincerely,

Denis C. K. Lin, Ph.D.

DCKL:rp
Attachments

cc: Mr. Tom Burke, NJDEP, Trenton, NJ

284 RARITAN CENTER PARKWAY • EDISON, NJ 08837 (201) 225-5600

TCDD Data Report - Page 1

Lab: ETC Corp.

Date: 07/10/83
GC Column: 60M SP2340

ETC Number	Sample Number	E/C	Grams Wet Weight	ppb TCDD	D.L.	320/322	Surrogate Percent Accuracy	Area 320	Area 322	Area 257	Area 328+	Area 332	Area 334	Comments
MB57-1	MB	J/AD	-	ND	0.04	-	101	-	-	-	2368	2546	3328	
C3392S	QA SPIKE	J/AD	10.00	0.99	-	0.82	108	340	417	240	907	961	1140	
C5348	QA REP	J/AD	10.82	ND	0.27	-	104	-	-	-	140	143	203	
C5348R	QA REP	J/AD	10.74	ND	0.29	-	112	-	-	-	93	89	122	
C6335	1247	J/AD	10.30	-	-	3.62*	101	474	131	84	291	334	396	High D.L.
C6336	1274	J/AD	10.61	ND	0.83	-	101	-	-	-	98	112	130	
C6337	19049	J/AD	10.88	0.73	-	0.68	96	58	85	-	190	219	275	
C6338	19052	J/AD	10.51	ND	0.33	-	92	-	-	-	112	141	163	
C6339	19055	J/AD	11.29	ND	0.08	-	106	-	-	-	251	261	332	
C6340	19060	J/AD	10.05	ND	0.08	-	103	-	-	-	982	1087	1304	
C6341	19062	J/AD	10.15	ND	0.18	-	94	-	-	-	146	175	213	
C6342	19063	J/AD	10.70	ND	0.25	-	99	-	-	-	312	343	445	
C6343	19073	J/AD	10.41	ND	0.09	-	93	-	-	-	1522	1812	2289	
C6344	19075	J/AD	10.14	ND	0.06	-	100	-	-	-	1686	1874	2356	
C6345	19086	J/AD	10.09	ND	0.25	-	101	-	-	-	346	380	488	
C6346	19094	J/AD	11.04	ND	0.29	-	102	-	-	-	288	323	383	
C6347	20145	J/AD	10.98	ND	0.21	-	97	-	-	-	656	719	966	
C6348	20146	J/AD	10.37	ND	0.18	-	101	-	-	-	1118	1203	1563	
C6349	20224	J/AD	10.54	ND	0.06	-	106	-	-	-	1623	1701	2133	

+Corrected for contribution by native TCDD (Subtract 0.009 of m/e 322).
*Due to sample matrix interference analysis does not meet method performance criteria - see comment.

MB = Method Blank
P = Partial Scan
N = Native TCDD Spike
D = Duplicate (Intralab)
FB = Field Blank

H = High Resolution
ND = Not Detected
DL = Detection Limit
J = Jar Extraction
S = Soxhlet Extraction

A, B, C,D- Clean Up Option (or any combination)

CALIBRATION SUMMARY

ug/kg* TCDD	Native RRF	DATE	TIME	Surrogate RRF
1.0	0.96	7/09/83	2030 hrs.	1.06
5.0	0.88	7/09/83	2115 hrs.	1.07
25.0	0.85	7/09/83	2150 hrs.	0.99
1.0	0.91	7/10/83	0915 hrs.	1.00

* Assumes 10 gram sample.

QUALITY CONTROL SUMMARY

ITEM	# OF DATA POINTS	MEAN ± S.D.
Surrogate Accuracy	25	100+/-5
Native TCDD Recovery	1	99%
Method Blank	1	ND
Duplicate Pairs	1	ND
Partial Scan Confirmation	1	Unconfirmed

CALIBRATION SUMMARY

ug/kg* TCDD	Native RRF	DATE	TIME	Surrogate RRF
1.0	0.82	7/06/83	0900 hrs.	0.99
5.0	0.80	7/06/83	0935 hrs.	0.98
25.0	0.80	7/06/83	1015 hrs.	1.01
1.0	0.81	7/10/83	0920 hrs.	1.00

* Assumes 10 gram sample.

QUALITY CONTROL SUMMARY

ITEM	# OF DATA POINTS	MEAN ± S.D.
Surrogate Accuracy	25	100+/-5
Native TCDD Recovery	1	99%
Method Blank	1	ND
Duplicate Pairs	1	ND
Partial Scan Confirmation	1	Unconfirmed

CALIBRATION SUMMARY

ug/kg* TCDD	Native RRF	DATE	TIME	Surrogate RRF
1.0	0.75	6/23/83	1040 hrs.	0.95
5.0	0.74	6/23/83	1130 hrs.	0.95
25.0	0.72	6/23/83	1250 hrs.	0.90
1.0	0.80	7/10/83	0925 hrs.	0.97
1.0	0.79	7/10/83	1800 hrs.	0.98

* Assumes 10 gram sample.

QUALITY CONTROL SUMMARY

ITEM	# OF DATA POINTS	MEAN +/- S.D.
Surrogate Accuracy	25	100+/-5
Native TCDD Recovery	1	99%
Method Blank	1	ND
Duplicate Pairs	1	ND
Partial Scan Confirmation	1	Unconfirmed

Partial Scan Confirmation

		Response Ratios			% Relative Abundances*							
ETC Number	Sample Number	320/324	257/259	194/196	160	161	194	196	257	259	320	324
C5471	-P	1.49	1.64	1.44	40	83	39	27	30	19	80	54

* Relative to m/e 322.

REFERENCE NO. 6

Gulf Oil Chemicals Company
Houston, Texas

Sampling Program At Berkeley Heights Site and Recommended Dioxin Testing Berkeley Heights, New Jersey

WESTON
DESIGNERS CONSULTANTS ®

SECTION 1

INTRODUCTION

1.1 SITE LOCATION

The Berkeley Heights Site is located in Berkeley Heights, New Jersey between Plainfield Avenue and Summit Avenue, north of McClellan Road and south of the Passaic River. The site slopes gradually toward the northwest. The site is approximately 4.8 acres in size. Figure 1 is a general layout of the site as it existed in 1978.

1.2 SITE HISTORY

The Berkeley Heights Site is now owned by Gulf Oil Chemicals Company, A Division of Gulf Oil Corporation. The site was previously owned by Millmaster-Onyx, a division of Kewanee Industries.

The Berkeley Heights plant produced organic specialty chemicals until the third quarter of 1981. Prior to that time, chemical wastes were disposed of off-site by licensed chemical waste haulers. Certain wastewaters were also directed to several lagoons on site, during the life of the operation. These lagoons, outlined on Figure 1, were closed prior to 1978, with the exception of a Clearwater Lagoon which received non-contact water. The Clearwater Lagoon was closed in 1981.

The buildings at the plant site were demolished in May/June of 1982; however, concrete foundations still remain. Portions of the site were covered with clean fill during the same time period as the building demolition. After demolition, some evidence of polychlorinated biphenyl (PCB) contamination was found in the southeast portion of the site, near the Building 4 slab. Since certain of the facilities had employed a hot oil heat transfer loop using Arochlor 1248 as heat transfer medium, and since at one time (late 1960's) certain of these heat transfer lines in Building 2 had ruptured, these were considered to be the sources of PCB contamination.

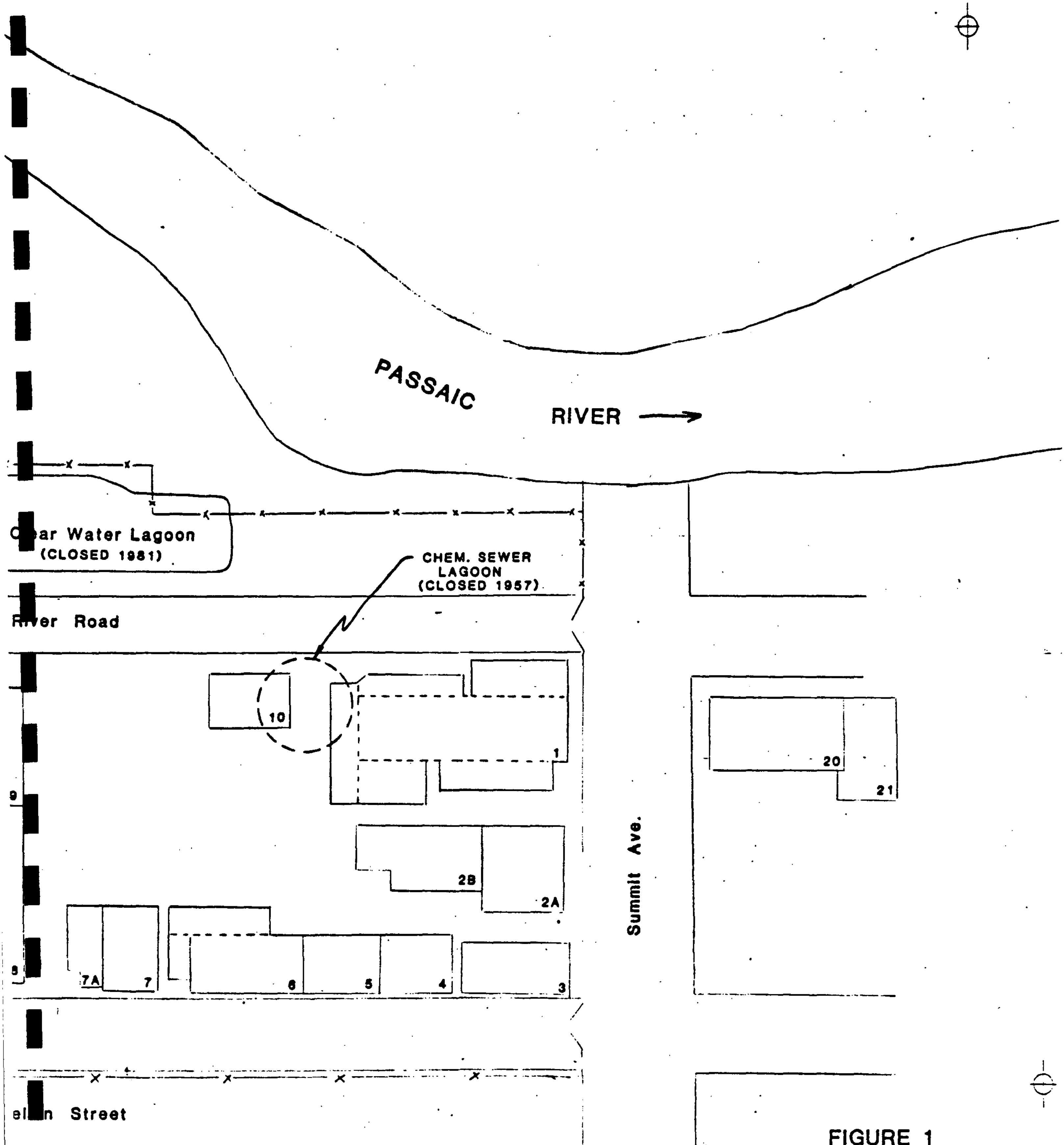


FIGURE 1

ELEY HEIGHTS SITE
BERKELEY HEIGHTS, N.J.

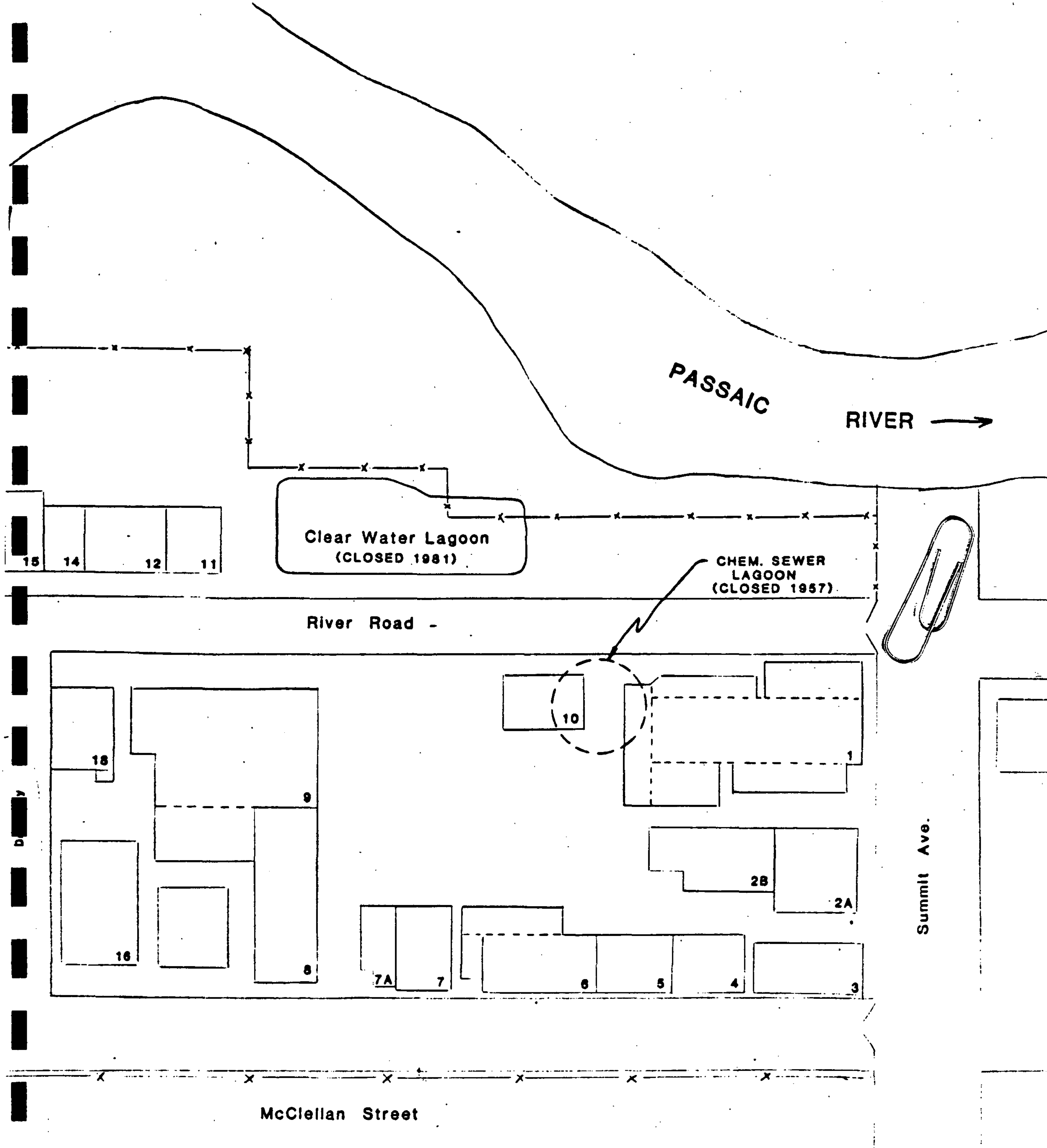
WESTON

PENNSYLVANIA

CHECKED	DATE	CLIENT APPROVALS	DATE
DES. ENG.			
PROJ. ENG.			
PROJ. MGR.			
APPROVED			
APPROVED		ISSUED FOR	DATE

This map is traced from Plan A-1 titled "Plot Plan & Site Plan" drawn by John Borakos A.I.A. on Jan. 24, 1978 and revised on Aug. 24, 1978
(The scale has been changed from 1"=50' to 1"=30')

DRAWN	DATE	DWG. NO.	REV
MRD	10-11-82		
SCALE 1"=30'	W.O. NO. 2108-02-01	SHT 2 OF 2	

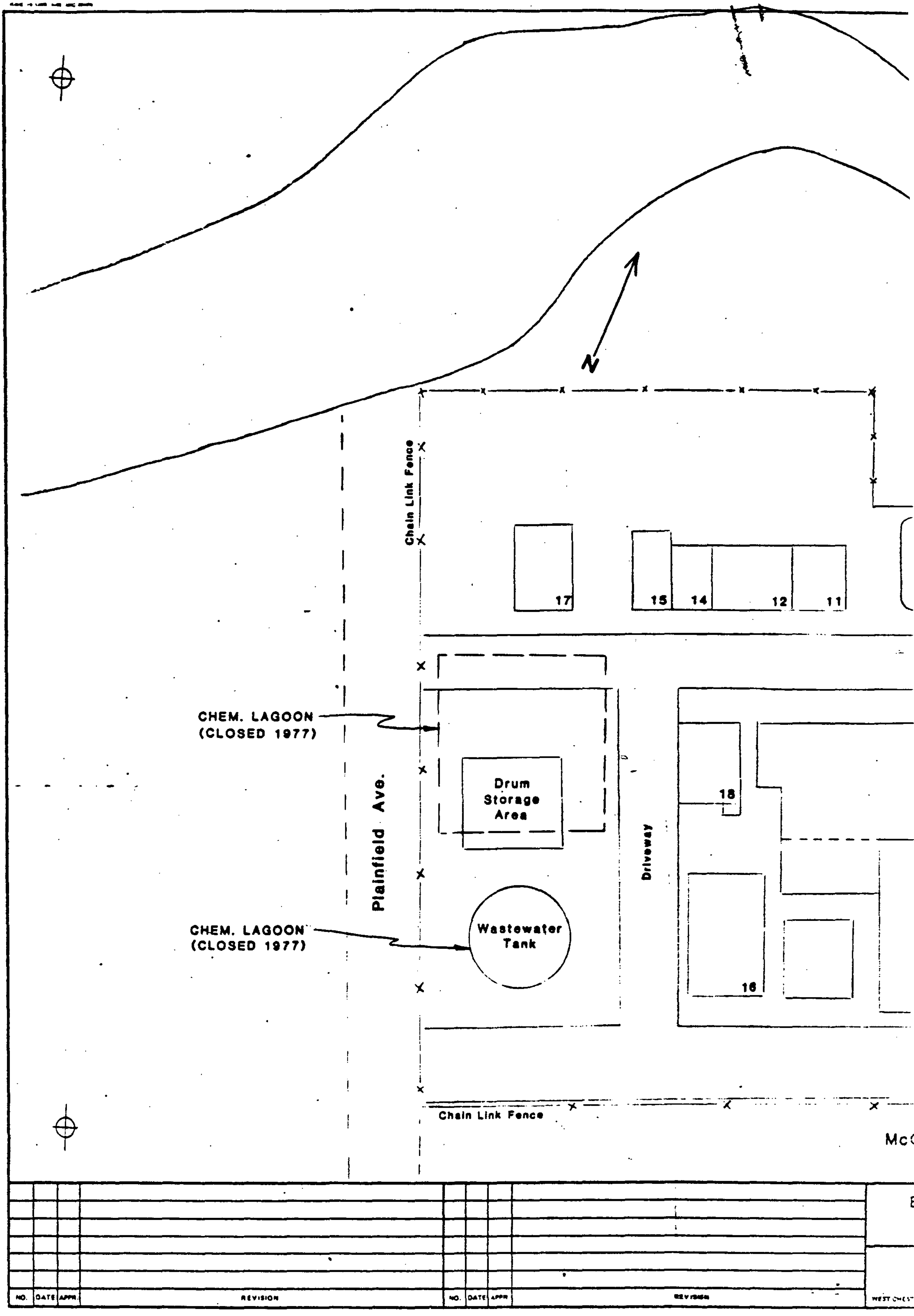


BERKELEY HEIGHTS SITE
BERKELEY HEIGHTS, N.J.

WESTON
WEST CHESTER PENNSYLVANIA

CHECKED	DATE	CLIENT APPROVALS	DATE
DES. ENG.			
PROJ. ENG.			
PROJ. MGR.			
APPROVED			
APPROVED		ISSUED FOR	DATE

REVISIONS



N
Chain Link Fence
17
15
14
12
11
CHEM. LAGOON
(CLOSED 1977)
Drum
Storage
Area
Plainfield Ave.
Driveway
18
CHEM. LAGOON
(CLOSED 1977)
Wastewater
Tank
16
Chain Link Fence
Mc
NO.
DATE
APPR.
REVISION
NO.
DATE
APPR.
REVISION

1.3 WESTON WORK SCOPE

The services of Roy F. Weston, Inc. (WESTON) were retained in August 1982 to determine the magnitude and extent of PCB contamination at the Berkeley Heights Site, to define any short-term contaminant action, and to suggest required long-term remedial actions. The magnitude and extent of PCB contamination was determined by means of a phased soil/water sampling and analysis program.

1.4 INTERIM CORRECTIVE MEASURES

Interim corrective measures were taken at the Berkeley Heights Site to ensure that contamination would not leave the site area by means of surface runoff and to improve site security. These interim measures were installed by subcontractors in early December of 1982 and in late January 1983 with guidance provided by a WESTON field engineer. Diversion berms, stone filter berms, and a sediment control fence were installed. Grading was performed in the northeast sector of the site to level existing berms and fill existing trenches. Portions of the existing site fence were repaired, and a new fence and gate were erected along the eastern perimeter of the site.

A detailed description of the summary of work for these interim corrective measures is provided, for information, in Appendix A.

SECTION 2

SAMPLING ANALYSIS PROGRAM

2.1 OVERVIEW

WESTON established a surface grid-locator system and collected both surface and subsurface soil samples throughout the site, and also at short distances outside the fence line. Water samples were collected from surface drainageways and from the Passaic River. Samples of Passaic River sediment were also collected.

The now-covered former Clearwater Lagoon area was sampled at one-foot vertical intervals to a maximum depth of eighteen feet.

Sample preparation, collection, and handling procedures are described in Sub-sections 2.2 through 2.6. Analytical results are described in Sub-section 2.7. The current condition of the samples is described in Sub-section 2.8.

The samples were assigned sequential field numbers, with a letter prefix which defined the type of sample. The different types of samples, and dates collected, are summarized below:

Prefix	Designation	Date Collected
S-	soil or sediment	August 1982
SA-	soil or sediment	September 1982
TRS-	river sediment	September 1982
W-	water, from test pits or trenches	August and October 1982
RW-	river water	Sept and Oct 1982
A- thru K-	split-spoon samples (former Clearwater Lagoon area only)	January 1983

2.2 SAMPLE BOTTLE PREPARATION

The sample bottle preparation procedure was consistent with the below-listed protocol. This protocol was accomplished in the WESTON laboratory.

a. Amber Bottles:

- Soak bottles in detergent.
- Rinse with copious amounts of distilled water.
- Rinse with acetone.
- Rinse with hexane (nanograde).
- Air dry.
- Heat to 200°C.
- Allow to cool.
- Cap with clean caps with teflon liners.

b. Bottle Caps:

- Remove paper liners from caps.
- Wash with detergent.
- Rinse with distilled water.
- Dry at 40°C.

c. Teflon Liners (avoid contact with fingers):

- Wash with detergent.
- Rinse with distilled water.
- Rinse with acetone.
- Rinse with hexane (nanograde).
- Air dry.

Place liners in cleaned caps; heat to 40°C for two hours. Let cool in vacuum desiccator until used.

2.3 SAMPLE COLLECTION

2.3.1 Surface Soil

Surface soil composite samples were collected from each sample grid area by scraping the top one-inch of soil every few feet (two to three feet) with a disposable plastic spoon sampler. Each scoop of the soil was placed into prepared amber glass bottles with teflon-lined lids. These were kept at below 4°C for transport to WESTON's laboratory.

In addition, surface samples were collected away from the immediate site area to establish "background" PCB levels. Surface samples were collected for this purpose from the southwest corner of the site, along the western fence line, and in the vicinity of Buildings 7 and 8. Samples were also taken at the intersection of Summit Avenue and old River Road east of the fence gate.

2.3.2 Test Pits

Test pits were excavated using a backhoe. Depths ranged up to eight feet, with all but two test pits between two and three feet. A description of the contents and soil characteristics of each test pit is contained in Appendix B.

A WESTON soil scientist climbed into each pit, cleaned off the test pit walls using a rock hammer, and sampled selected intervals of the soil profile using a disposable plastic spoon sampler. Samples were collected from each distinct soil or fill horizon. Adjacent to some test pits, six-inch concrete slabs and four-inch gravel footings were encountered. Samples were collected from the soils below these features. Each sample was placed into a prepared amber glass bottle with a teflon-lined lid. These were kept at below $4^{\circ}C$ for transport to WESTON's laboratory. All non-disposable sampling tools were cleaned with hexane and deionized water between test pits to avoid cross-contamination of samples.

2.3.3 River Sediment

Samples of sediment from the Passaic River were collected from a boat using a Wildco K-B Design Heavy Duty Gravity Corer. This device consists of a 2-inch diameter, 20-inch long hollow plastic tube which fits inside a hollow metal casing. The assembly was dropped by rope to the river bottom where it sank into the soft sediment, forcing it up into the plastic tube. A brass "messenger" was then dropped along the rope to seal off the top of the tube, creating a suction that retained the contents while the assembly was pulled to the surface.

Each sample, still contained in its plastic liner, was removed from the corer, the liner was capped at both ends, and was transported to WESTON's laboratory for analysis.

2.3.4 Water

Water sample W-A was collected from a drainage ditch between the site property and the Passaic River, after digging approximately one-inch below the surface. Water sample W-B was collected from a temporary accumulation of water just south of the drainage ditch. Water sample W-C, also just south of the drainage ditch, was collected after digging a hole approximately 18 inches in diameter and 12 inches deep, and waiting (20 minutes) for the hole to fill. All water samples were collected in 2.5-gallon glass jugs, were capped with teflon-lined lids, and were maintained at 4°C during transport to WESTON's laboratory.

Passaic River water samples (RW-1, RW-2, RW-3, RWA, RWB) were collected, from a boat, by immersion of a 2.5-gallon glass jug at each sample location.

Test pit water samples (W-1, W-2, W-3, W-4, SA-44, 59, 60) were also collected in 2.5-gallon glass jugs. Water samples to be analyzed for metals were spiked with nitric acid, for preservation (to maintain solubility), prior to transport to WESTON's laboratory.

It should be noted that certain of the test pits (e.g. TP-8 and TP-10) were filled with water when excavated, indicating a high perched or natural water table.

2.3.5 Soil (former Clearwater Lagoon)

In order to determine the quantity and extent of PCB contamination in the former Clearwater Lagoon Area, nine soil borings were drilled in and adjacent to the lagoon, and split spoon samples from one foot depth intervals were collected and described. Boring locations and boring cross-sections are shown and boring logs are described in Appendix C.

The boring was accomplished by a subcontractor using a truck-mounted drilling rig. The sampling was accomplished by driving a two-inch diameter split spoon sampler to a depth of 24 inches at a time; six inch augers were used to advance the hole. Hammer blows were recorded for each six-inch interval. After each two-foot interval, the filled spoon was turned-over to a WESTON soil scientist and technician. The filled spoon was then taken to a sample collection and decontamination station set-up at the inside edge of the bermed area. Each sample was divided in half, physical soil or fill characteristics were recorded, and the halves were placed in two labelled amber glass bottles with teflon lined lids. They were packed in coolers for daily transport to WESTON"s laboratory. By means of this procedure, samples were collected from one foot intervals in each boring.

Field decisions were made by WESTON to sample beyond the originally designated 15 feet in several borings since the fill and sludge extended to 15 feet below ground surface. Split spoon samples were continued into the stiff, dry clay below the lagoon so that actual lagoon depth could be characterized. A ninth boring (K) was added to check fill depth when the 12-14 foot sample from Boring E could not be recovered.

In addition to the split spoon samples, two four-foot soil borings were dug with a three inch diameter hand bucket auger between the lagoon and the Passaic River. Samples were collected at one foot intervals, and were placed into amber glass bottles with teflon-lined lids.

After samples were removed from each split spoon, the spoon was scraped out using a putty knife and pre-washed with soapy water. It was then scrubbed in a clean soap and water solution, rinsed with running water from a hose hooked up inside the garage building, then rinsed with deionized water and hexane. The spoon was reassembled and returned to the driller for the next sample. Two split spoon samplers were alternately used to speed the field operations. A total of 129 soil samples were collected from the former Clearwater Lagoon area. Of this total, a selected total of 33 samples (25 percent) were analyzed. The remainder were stored unanalyzed.

2.4 SAMPLE PRESERVATION AND TRANSPORT

As previously described in Sections 2.2 and 2.3, all samples (soil or water) were collected and placed into prepared bottles. The bottles were placed in iced coolers, maintained at approximately 4°C, and were transported to the procedures, although the handling of these samples was as described above.

2.6 LABORATORY HANDLING, PREPARATION, ANALYSIS

Sample preparation and analytical techniques used were as follows:

PCB in Soil

1. Air dry soil samples on aluminum foil, then sieve through a 35-mesh screen (U.S. Series 600 micrometers).

2. Weigh-out 10 grams of dried sieved soil and place in a 100-ml French square. Cap with a teflon-lined cap. Include a method blank, and for each ten samples, one duplicate and one known spiked sample for quality control.

3. Extract by adding 50-ml of pesticide-grade hexane and placing samples on a shaker table overnight.

4. After allowing samples to settle, withdraw one-ml of solvent and analyze by gas chromatograph. Analytical results are on a dry weight basis.

5. If interferences are encountered, clean-up using a florisil procedure (60/100 mesh, PR grade). An additional clean-up with sulfuric acid can also be used.

PCB in Water

1. Reference method 608, Organochlorine Pesticides and PCB's, Federal Register, Vol 44, No. 233, December 3, 1979.

2. All water samples, except W-1 through W-4, were filtered in the laboratory prior to analysis.

Fluoride in Water

1. Reference EPA Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Method 340.2.

Nitrate in Water

1. Reference EPA Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Method 353.3.

Metals in Water

1. Reference EPA Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020:

As Method 206.3	Pb Method 239.1
Ba Method 208.1	Hg Method 245.1
Cd Method 213.1	Se Method 270.3
Cr Method 218.1	Ag Method 272.1
	Na Method 273.1

Metals in Soil

1. Reference EP Toxicity Extraction Procedure: Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, SW-846, 1980.

2. Reference EPA-600/4-79-020, 1979.

3. Reference Inductively-Coupled Plasma (ICP) Optical Emission Spectrometric Method for Trace Element Analysis of Water and Wastes, Federal Register, Vol. 44, No. 233, Appendix IV, December 3, 1979.

As Ref. F.2 Method 206.2	Hg Ref. F.2 Method 245.1
Ba Ref. F.3	Se Ref. F.2 Method 270.2
Cd Ref. F.3	Ag Ref. F.3
Cr Ref. F.3	Na Ref. F.2 Method 273.1
Pb Ref. F.3	

Volatile Organics in Soil

1. A soil sample is placed into a 30-ml crimped-top vial and sealed.

2. The vial is placed into a boiling water (100°C) bath for five minutes.

3. One ml of "headspace" air is withdrawn and injected into a gas chromatograph/mass spectrometer and analyzed according to Method 624, Purgeables, Federal Register, Vol. 44, No. 233, Appendix IV, December 3, 1979.

Priority Pollutant Scan: Composite Soil Sample

1. A soil composite is prepared from 10 grams each of already dried and sieved soil samples.

2. The composite sample is analyzed by gas chromatography/mass spectroscopy (GC/MS) for all priority pollutant extractables, i.e., base neutral compounds, acid compounds, pesticides, PCB's, and volatile organics. The latter analysis (volatiles) is of limited value due to the inevitable escape of a substantial quantity of any volatiles present during the drying and sieving operations.

2.7 ANALYTICAL RESULTS

Levels of PCB's up to 3,740 mg/kg (ppm) were measured in the surface and test pit soils, with three widely-separated "hot spots" (>200 ppm). The PCB was Arochlor 1248 in all instances. Sediments and water samples from the adjacent Passaic River, and from adjacent off-site areas, were found to be essentially uncontaminated by PCB's, the only exception being sediment collected from minor erosion ditches along the northeast and northwest edge of the site (reference Figure 2). Samples collected from the test pits generally showed decreasing levels of PCB's with depths, e.g., Test Pit L showed 304 mg/kg at the surface, 145 mg/kg at 18-inch depth, and <5 mg/kg at 34-inch depths; similarly, Test Pit 5 showed 1,040 mg/kg at 3 to 6-inch depth and 18 mg/kg at 10 to 12-inch depth.

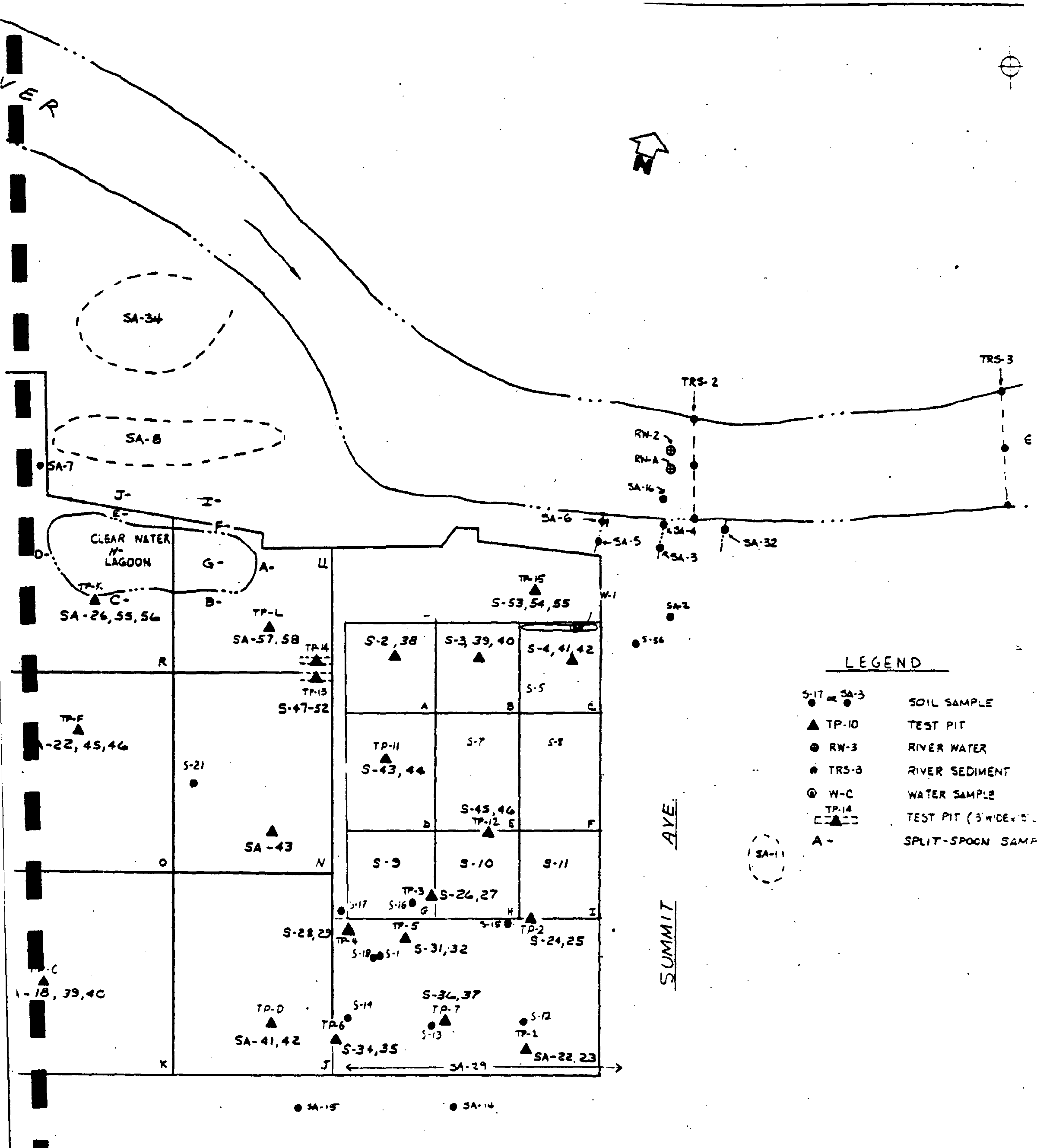
A fourth hot-spot was located within the confines of the former Clearwater Lagoon area. The PCB (Arochlor 1248) levels increased with depths to an approximately 10-foot depth, then decreased to non-detectable (<5 mg/kg) as the underlying clay layer was reached at an approximately 14 to 15-foot depth. Maximum PCB level measured was 6,000 mg/kg at a depth of 10-feet. The PCB levels from boreholes along the southern and western perimeter of the former Clearwater

Lagoon area ranged from non-detectable to 80 mg/kg. The detectable levels were confined to the top six feet, essentially within the limits of the Clearwater Lagoon area. No detectable levels of PCB were found in the borings on the northern and eastern perimeter of the former Clearwater Lagoon area.

Organic contamination, but no significant PCB contamination, was detected in two test pits (TP-13 and TP-14) dug to a depth of three feet in one of the closed lagoon areas. Volatile organics measured in soil samples included ethylbenzene (2 to 85 mg/kg), toluene (up to 12 mg/kg), and chlorobenzene (1 to 191 mg/kg).

A priority pollutant scan was performed on a composite soil sample made up of six soil samples from within the confines of the former Clearwater Lagoon area. The most noteworthy results were detectable quantities of xylenes (despite the sample having been dried and sieved), an unidentifiable compound with the apparent formula $C_{12}H_8SO_2Cl_2$ in the 100 to 1000 mg/kg range, and 100 mg/kg of trichlorophenol (either 2, 4, 5 or 2, 4, 6; identification not positive). No specific scan for dioxin-type compounds was made. The presence of major quantities of a dioxin compound (>>100 ppb) might be evidenced in the form of an unidentified peak or peaks from the priority pollutant scan. No such peaks were noted; however, it is emphasized that dioxin compounds are not part of the priority pollutant scan.

All sample results are listed in Tables 1 through 9.



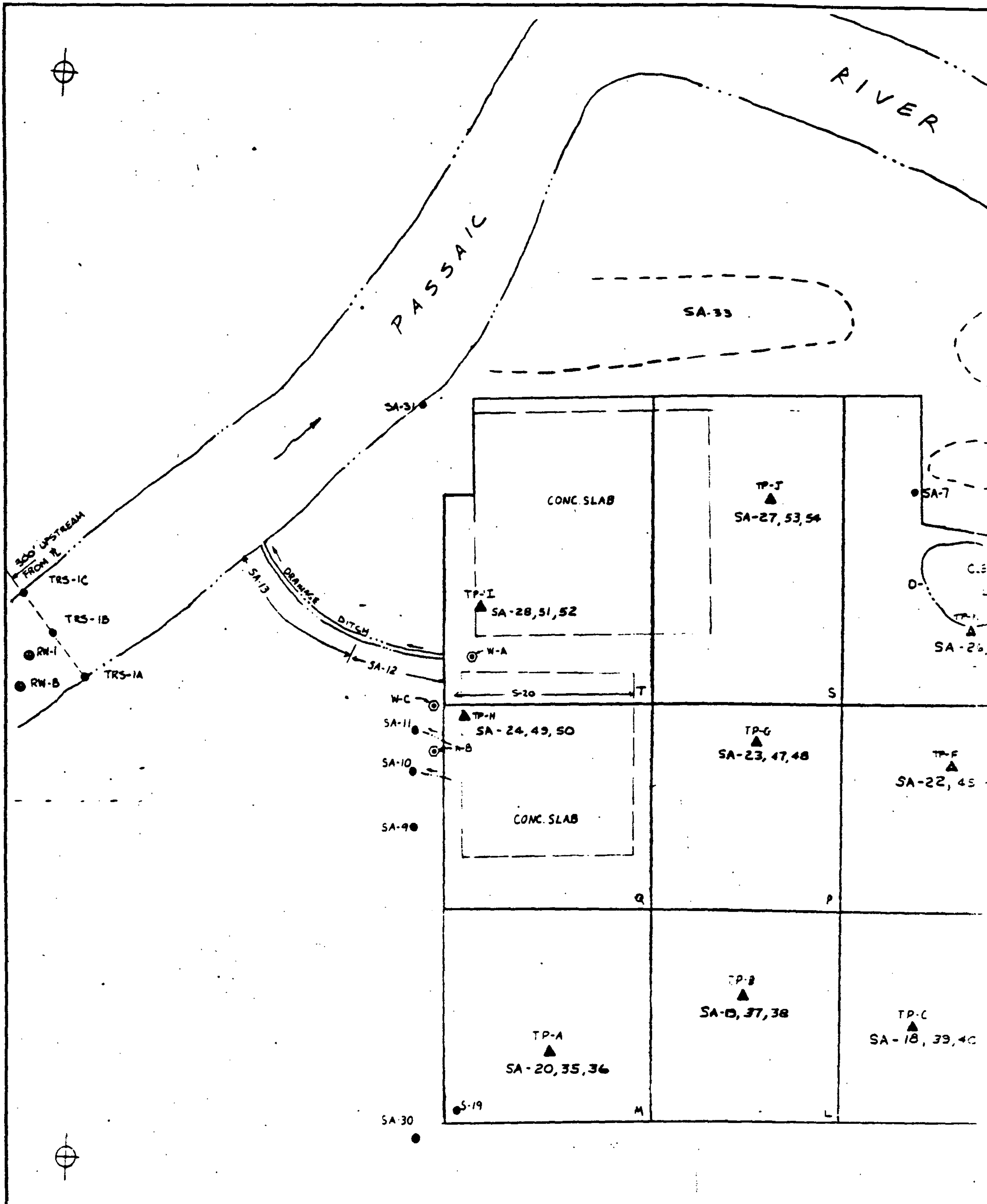
BERKELEY HEIGHTS SITE BERKELEY HEIGHTS, NJ	CHECKED	DATE	CLIENT APPROVALS	DATE
WESTON DESIGNERS CONSULTANTS	DES. ENG.			
WESTCHESTER PENNSYLVANIA	PROJ. ENG.			
	PROJ. MGR.			
	APPROVED			
	APPROVED		ISSUED FOR	DATE

FIGURE 2

FIELD INVESTIGATION LOCAT

AUG. - OCT. 1982

DRAWN	DATE	DWG. NO.
MRD	10-11-82	
SCALE	W.O. NO.	
NOT TO SCALE	2108-02-01	SH.



NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
1	10-13 1982	MRD	moved TRS-3 55' West Added S-5, S-18 + TP S 10-12"				
2	[illegible]	DDC	ADDED ... OF RIVER, TP13, TP14, RW-4, RW-B, W-A, W-B, W-C, CLEAN WATER ...				

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TABLE 1

Soil & Sediment Sample Location & Analysis

Field Sample No.	RFW No.	Location	PCB (mg/kg)	%Mois
SA-1	20142	Office lawn area	<5.0	1.7
SA-2	20143	Summit Avenue outside gate	14.9	1.0
SA-3	20144	Drainageway - end of Summit Ave.	32.8	1.2
SA-4	20145	Drainageway - end of Summit Ave. river edge	19.6	1.4
SA-5	20146	Drainageway - head	133	2.4
SA-6	20147	Drainageway - edge of river	<5.0	7.0
SA-7	20148	Recent deposition North of property fence	24.4	2.4
SA-8	20149	Erosion gully on South side of river	32.2	2.6
SA-9	20150	West of property fence	339	2.8
SA-10	20151	" " " "	16.2	1.2
SA-11	20152	Oily seep west of property fence	<5.0*	0.7
SA-12	20153	Drainageway - 16' west of fence	174	3.3
SA-13	20154	Drainageway - 16' comp. to riverbank	161	2.0
SA-14	20155	South of McClellan Ave. - background sample	<5.0	3.2
SA-15	20156	South of McClellan Ave. - background sample	<5.0	3.6
SA-16	20157	Sediment sample 6' into swollen river north of Summit Ave.	17.6	1.3
SA-17	20158	Area J surface comp.	49.6	0.8
SA-18	20159	Area K " "	26.9	0.5
SA-19	20160	Area L " "	5.1	0.7
SA-20	20161	Area M " "	<5.0	2.1
SA-21	20162	Area N " "	36.8	1.0
SA-22	20163	Area O " "	30.6	9.7
SA-23	20164	Area P " "	<5.0	0.9
SA-24	20165	Area Q " "	23.0	1.1
SA-25	20166	Area U " "	30.4	2.5
SA-26	20167	Area R " "	61.8	0.7
SA-27	20168	Area S " "	8.1	0.8
SA-28	20169	Area T " "	54.0*	1.6
SA-29	20170	McClellan St. west of Summit Ave.	65.1	1.1
SA-30	20171	Southwest corner - outside fence	<5.0	3.7
SA-31	20172	Northwest corner of site	<5.0	2.3
SA-32	20173	Drainageway - end of Summit Ave.	<5.0	0.9
SA-33	20225	Island oxbow - west	<5.0	1.57
SA-34	20224	Island oxbow - east	37.9	1.6[illegible]
SA-35	20221	TP-A 10"	4.2	0.6[illegible]
SA-36	20218	TP-A 20"	<5.0	0.8[illegible]
SA-37	20217	TP-B 10"	<5.0	0.3[illegible]
SA-38	20220	TP-B 24"	119.6	0.5[illegible]
SA-39	20222	TP-C left side 15"	<5.0	0.6[illegible]
SA-40	20219	TP-C right side 20"	<5.0	1.2[illegible]

*Major impurity present.

Soil & Sediment Sample Location & Analysis

Field Sample No.	RFW No.	Location	PCB (mg/kg)	% Moistur
SA-41	20212	TP-D 10"	<5.0	0.31
SA-42	20213	TP-D 24"	<5.0	0.47
SA-43	20214	TP-E 20-25"	<5.0	0.61
SA-45	20216	TP-F 12"	<5.0	0.31
SA-46	20215	TP-F 30"	<5.0	0.74
SA-47	20204	TP-G 12"	<5.0	0.34
SA-48	20203	TP-G 24"	<5.0	0.42
SA-49	20208	TP-H 24"	62.3	0.56
SA-49A	20210	TP-H 24"	125.9	0.66
SA-50	20206	TP-H 40"	1673.3	0.61
SA-50A	20207	TP-H 40"	2259.6	0.55
SA-51	20211	TP-I 18"	<5.0	0.78
SA-52	20205	TP-I 40"	<5.0	0.37
SA-53	20201	TP-J 10"	6.71	0.42
SA-54	20202	TP-J 20"	<5.0	0.25
SA-55	20197	TP-K 12"	525.6	0.29
SA-56	20200	TP-K 30"	<5.0	0.42
SA-57	20196	TP-L 18"	<5.0	0.20
SA-57A	20198	TP-L 18"	14.4	0.28
SA-58	20199	TP-L 34"	<5.0	0.80
SA-58A	20195	TP-L 34"	<5.0	0.46
TRS-1A	20237	South bank upstream sediment	<5.0	1.67
TRS-1B	20235	Center - upstream sediment	<5.0	0.75
TRS-1C	20234	North side bank upstream sediment	<5.0	0.7
TRS-2D6	20238	South bank - 6' into river sediment		0.4
		North of Summit Ave.	<5.0	0.4
TRS-2	20228	Center - sediment north of Summit Ave.	<5.0	0.4
TRS-2	20233	North bank - sediment - North of Summit Ave.	<5.0	1.1
TRS-3	20236	South bank - downstream sediment	<5.0	1.9
TRS-3F	20232	Center - downstream sediment	<5.0	1.8
TRS-3	20223	North bank - downstream sediment	<5.0	1.0

TABLE 3

BERKELEY HEIGHTS SITE

SOIL SAMPLES

Sample Number	Sample Location and Description	Sample Depth (inches)	PCB mg/kg dry wt.	% Moisture
S-1	Stake #1	0-1	1190	2.13
S-2	Area A	0-1	27.2	0.9
S-3	Area B	0-1	20.1	1.5
S-4	Area C	0-1	22.2	28.5
S-5	Area C Discolored Stain	0-1	44.6	22.2
S-6	Area D	0-1	119	1.4
S-7	Area E	0-1	92.2	2.0
S-8	Area F	0-1	94.8	1.9
S-9	Area G	0-1	912	1.6
S-10	Area H	0-1	292	1.7
S-11	Area I	0-1	213	1.0
S-12	Stake #2	0-1	17.8	0.6
S-13	Stake #3	0-1	2060	1.6
S-14	Stake #4	0-1	126	1.5
S-15	Stake #5	0-1	648	1.7
S-16	Stake #6	0-1	1510	1.5
S-17	Stake #7	0-1	163	29.0
S-18	Stake #1	0-1	5.1	2.14
S-19	Southwest corner of Site McClellan Street	0-1	8.9	1.3
S-20	Runoff path front of Bldg 17 - River Road	0-1	303	2.0
S-21	Roadway between Blds. 7 & 10 - rust staining	0-1	36.2	0.8
S-22	TP-1 gravelly sandy clay	13-16	3740	1.3
S-23	TP-1 mottled clay	16-24	6.6	2.3
S-24	TP-2 sandy fill	0-20	<5.0	19.7
S-25	TP-2 sand and water seep	20	24.8	0.5
S-26	TP-3 gravelly sandy clay	6	2810	2.59
S-27	TP-3 mottled clay	12-15	<5.0	1.3
S-28	TP-4 gravelly rubble & sandy loam fill	6-10	232	2.7
S-29	TP-4 mottled clay	14-17	<5.0	29.1
S-30	TP-5 gravelly rubble & sandy fill	3-6	1040	1.31
S-31	TP-5 duplicate of S-30	3-6	791	28.8
S-32	TP-5 sandy clay	10-12	18.3	1.3
S-33	TP-5 duplicate of S-32	10-12	9.8	1.8
S-34	TP-6 compacted hard clay loam & gravel	4-6	71.1	0.8
S-35	TP-6 compacted mottled clay	10-12	<5.0	1.6
S-36	TP-7 compacted hard clay fill & gravel	6-8	60	2.27
S-37	TP-7 firm mottled clay	10-12	11.8	1.3

TABLE 4

BERKELEY HEIGHTS SITE

SOIL SAMPLES

mple nber	Sample Location and Description	Sample Depth	PCB mg/kg	% Moisture
38	TP-8 compacted hard mottled clay	14-18	<5.0*	0.8
39	TP-9 compacted gravelly loam fill	4-8	17.8	2.3
-40	TP-9 mottled clay	10-12	<5.0	28.8
41	TP-10 mottled clay	12-15	<5.0	1.2
42	TP-10 duplicate of S-41	12-15	<5.0	2.1
-43	TP-11 compacted gravelly loam fill	4-8	187	1.9
44	TP-11 mottled clay	12-15	<5.0	2.2
45	TP-12 loose gravelly fill	6-10	307	2.4
-46	TP-12 mottled clay	10-15	<5.0	2.0
53	TP-15 loamy fill	0-6	<5.0	2.2
54	TP-15 compacted clay loam fill	6-12	11.2	1.5
-55	TP-15 mottled clay	12-18	9.1	3.8
56	East of gate adjacent Area C	0-1	47.4	2.0

ajor impurity present.

TABLE 5

BERKELEY HEIGHTS SITE

WATER SAMPLE LOCATION AND ANALYSIS

Field Sample No.	RFW No.	Location & Description	PCB ug/1
-1	19088	Water from Trench South of Berm	< 5.0
-2	19089	TP-8 Water (oily sheen)	172.0
-3	19090	TP-10 Water	< 5.0
-44	20227	TP-E Water	< 5.0
-59	20226	TP-L Water	< 5.0
-60	20209	TP-H Water	< 5.0
-1	20230	River Water - Upstream	< 5.0
-2	20229	River Water - No. of Summit Avenue	< 5.0
-3	20231	River Water - Downstream	< 5.0

TABLE 6

BERKELEY HEIGHTS SITE

Samples From Chemical Sewer Lagoon Area**

Sample No.	RFW No.	Location & Depth	PCB mg/kg Dry Wgt.	Percent Moisture	Volatile Organic mg/kg
S-47	19095	TP-13, 8' dp (oily sludge)	< 50.0	9.1	ethylbenzene 85 toluene 12
S-48	19096	TP-13, 0'-6"	< 5.0	1.1	chlorobenzene 18
S-49	19097	TP-13, 6-12"	< 5.0	0.5	chlorobenzene < 0.8
S-59	19098	TP-13, 12-18"	< 5.0	0.6	chlorobenzene 1.0
S-51	19099	TP-13, 18-24"	< 5.0	0.9	chlorobenzene 0.9
S-52	19100	TP-13, 24-36"	< 5.0	3.0	chlorobenzene 137 ethylbenzene 2
S-52 (duplicate)	---				chlorobenzene 191 ethylbenzene 3
W-4*	19101	TP-13, 8' deep (oily drum liquid)	< 5.0	--	ethylbenzene 4 toluene < 0.8 mg/l

*EP Toxicity Metals Cr 0.17 µg/l
As 0.03 µg/l

**Two backhoe trenches were excavated in an old "chemical sewer lagoon" area. Three broken and corroded drums were discovered in the eastern end of the trench at approximately 8' deep and were brought to the surface. One contained a black oily liquid which was sampled (W-4). An oily sludge surrounded the drums; this sludge was also sampled (S-47).

The western end of the trench appeared to be clean fill. No sludge was found. A small amount of water seeped into the bottom of the pit. Depth interval soil samples were taken from this end at 0-6", 6-12", 12-18", 18-24" and 24-36."

Trench TP-14 appeared free from sludge or barrels. No samples were obtained from this trench. Samples from TP-13 were analyzed for PCB's, EP TOX extraction metals, and for volatile organics.

WESTON

TABLE 8

BERKELEY HEIGHTS SITE

Soil Samples: Clearwater Lagoon Area

Field Sample No.	Location[2]	PCB Concentration[3]
A-3	Refer to Figure in Appendix C	ND
A-6	Refer to Figure in Appendix C	ND
A-10	Refer to Figure in Appendix C	ND
B-2	Refer to Figure in Appendix C	80
B-6	Refer to Figure in Appendix C	ND
B-10	Refer to Figure in Appendix C	ND
C-2	Refer to Figure in Appendix C	ND
C-6	Refer to Figure in Appendix C	15.5
C-10	Refer to Figure in Appendix C	ND
D-2	Refer to Figure in Appendix C	18
D-6	Refer to Figure in Appendix C	ND
D-10	Refer to Figure in Appendix C	ND
E-4	Refer to Figure in Appendix C	ND
E-6	Refer to Figure in Appendix C	ND
E-10	Refer to Figure in Appendix C	ND
F-2	Refer to Figure in Appendix C	ND
F-6	Refer to Figure in Appendix C	ND
F-10	Refer to Figure in Appendix C	ND
F-15	Refer to Figure in Appendix C	ND
G-2	Refer to Figure in Appendix C	10
G-6	Refer to Figure in Appendix C	24
G-12	Refer to Figure in Appendix C	98
G-14	Refer to Figure in Appendix C	ND
G-16	Refer to Figure in Appendix C	ND
H-2	Refer to Figure in Appendix C	22
H-8	Refer to Figure in Appendix C	1100
H-10	Refer to Figure in Appendix C	6000
H-12	Refer to Figure in Appendix C	1040
H-16	Refer to Figure in Appendix C	ND
I-2	Refer to Figure in Appendix C	ND
I-4	Refer to Figure in Appendix C	ND
J-2	Refer to Figure in Appendix C	ND
J-4	Refer to Figure in Appendix C	ND

NOTES:

1. Samples obtained 11-14 January 1983. 2. Location is defined by number designation of sample. Example, A-3 represents sample taken from A borehole at 2-3 foot depth; B-6 represents sample taken from B borehole at 5-6 foot depth. 3. Concentrations are in mg/kg (dry weight). ND is not detectable (less than 5 mg/kg). PCB is Arochlor 1248.

TABLE 10 (CONTINUED)

NOTES

- Inventory was taken on the following dates:

Storage Location 1	16 June 1983
Storage Location 2	16 June 1983
Storge Location 3	16 and 20 June 1983
Storage Location 4	20 June 1983

- Storage Locations 1, 2, and 4 are not refrigerated.

  Ambient temperature may reach 80-90°F (maximum).

- Storage Location 3 is refrigerated. Temperature is maintained at 4°C.

SECTION 3

SAMPLES RECOMMENDED FOR DIOXIN ANALYSIS

3.1 SELECTED SAMPLES

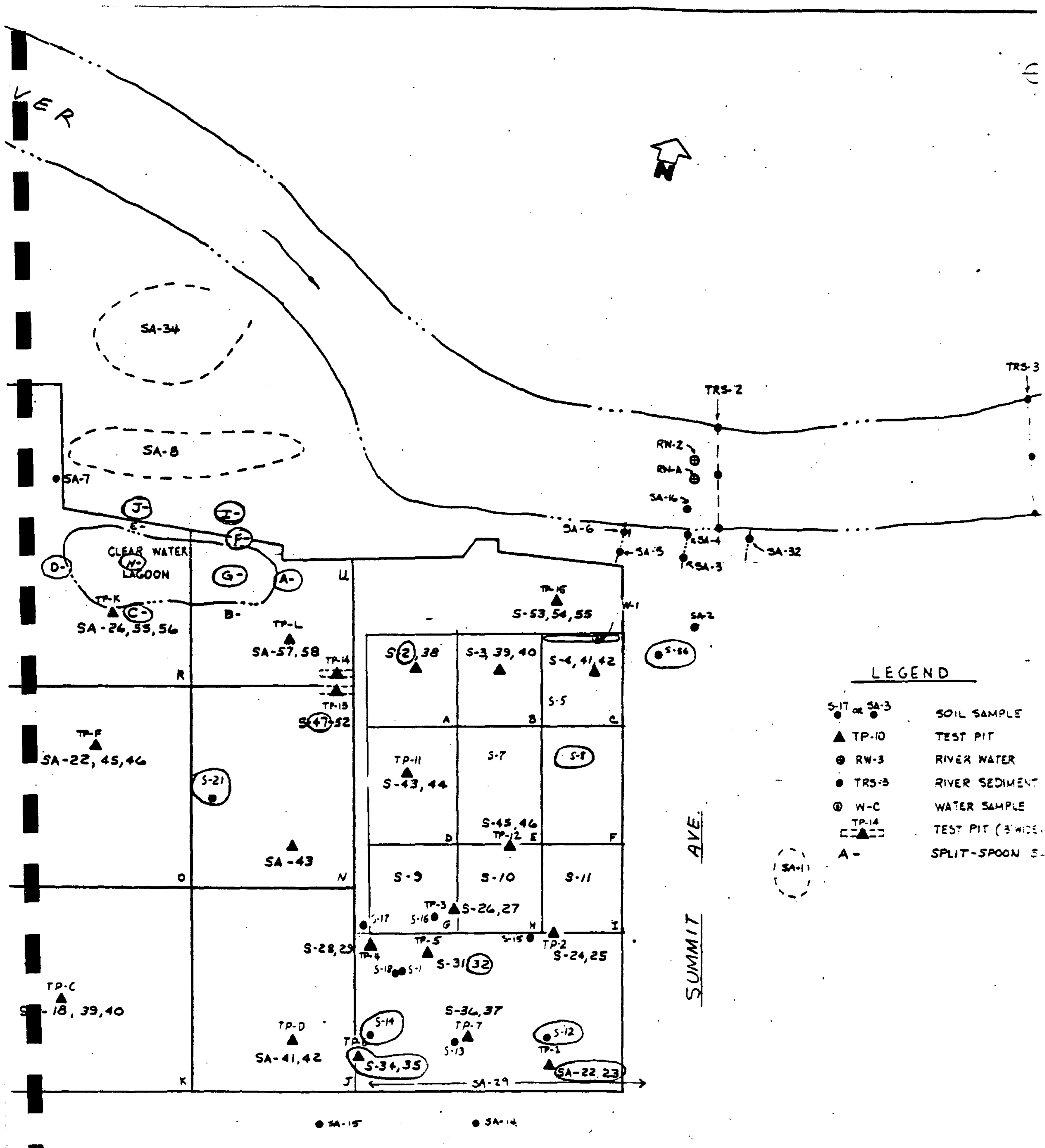
The potential exists for the presence of dioxin compounds on the Berkeley Heights Site, due, primarily, to the use of 2,4, 5 trichlorophenol (purchased from Dow Chemical) as a raw material. Dioxin is often present as an impurity in 2, 4, 5 trichlorophenol. As a result, at the request of Gulf Oil Chemicals Company, WESTON removed from storage and shipped four samples for dioxin analysis to ETC Laboratories in Edison, New Jersey. These samples were:

- S-30 (from TP-5)
- S-34 (from TP-6)
- S-38 (from TP-8)
- Clearwater Lagoon composite (from G-2, G-6, G-12, H-2, H-8, H-10).

Results were received on 14 June 1983. Results for dioxin were all negative (<1 ppb).

WESTON has selected 25 additional samples for dioxin analysis. These have been selected to provide a representative coverage of the site in those areas, such as process areas and chemical lagoon area, most likely to exhibit any detectable levels of dioxin if it were to be present. Also, several surface samples (S-19 and S-56) at the site boundaries have been selected to verify that no off-site migration has occurred.

Selected samples, and reasons for each selection, are outlined in Table 11. Selected samples are shown on Figure 3.



M NDED DIOXIN ANALYTICAL PROGRAM (CIRCLED IN RED)

BERKELEY HEIGHTS SITE

BERKELEY HEIGHTS, NJ

WESTON

DESIGNERS CONSULTANTS

WEST CHESTER PENNSYLVANIA

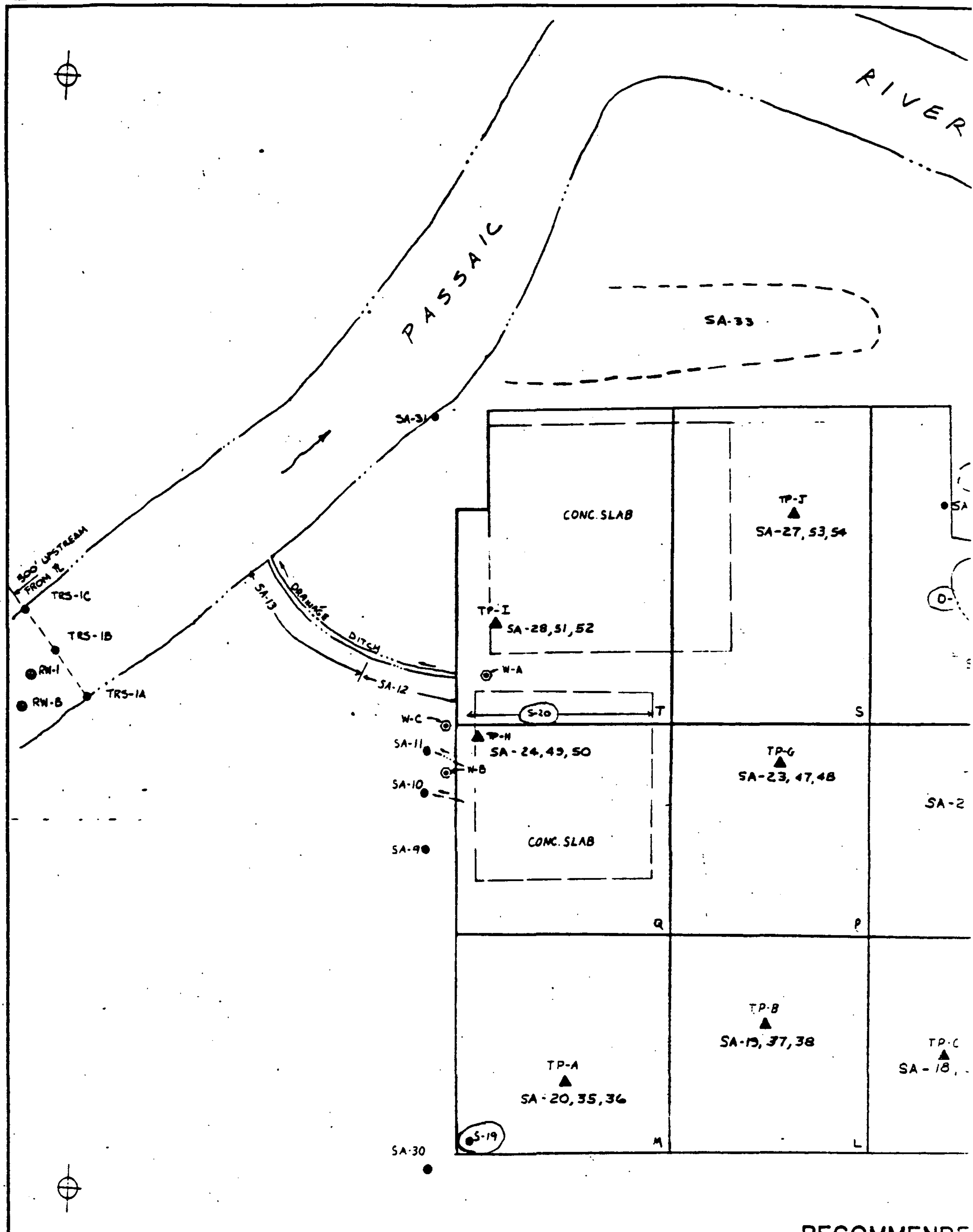
CHECKED	DATE	CLIENT APPROVALS	DATE
DES. ENG.			
PROJ. ENG.			
PROJ. MGR.			
APPROVED			
APPROVED		ISSUED FOR	DATE

FIGURE 3

FIELD INVESTIGATION LOC

AUG. - OCT. 1982

DRAWN	DATE	DWG. NO.
MRD	10-11-82	
SCALE	W.O. NO.	
NOT TO SCALE	2108-02-01	SHT.



RECOMMENDE

NO.	DATE	APPR	REVISION	NO.	DATE	APPR	REVISION
1	10-13 1982	WPD	moved TRS-3 55' West. Added S-5, S-18 + TP-5 10-12"				
2	2-22	PDC	ADDED LOC OF RIVER, TP13, TP14, RW-A, RW-B, W-A, W-B, W-C, +CLEAN WATER [illegible]				

TABLE 11

BERKELEY HEIGHTS SITE

RECOMMENDED DIOXIN ANALYTICAL PROGRAM

Sample Number	Location	PCB's (depth) (mg/kg)	Reason
S-19	Southwest corner of site (McCellan St.)	8.9 (0-1")	edge of site; also, vicinity of waste-water tank area
S-20	runoff front of Bldg. 17 (River Road)	303 (0-1")	vicinity of closed lagoon area
D-2	Clearwater Lagoon CL)	18 (1-2')	check west perimeter CL
A-3	CL	ND (2-3')	check east perimeter CL
C-2	CL	ND (1-2')	check southeast perimeter CL
C-6	CL	ND (5-6')	same
F-2	CL	ND (1-2')	check northeast perimeter CL
G-8	CL	- (7-8')	check lagoon contents; previously unanalyzed sample
G-13	CL	- (12-13')	same
H-12	Cl	1040 (11'-12')	check lagoon contents
I-1	outside fence line; north of CL	- (0-1')	check at depth between fence and river; previously unanalyzed sample
J-3	outside fence line; north of CL	- (2-3')	same

TABLE 11 (CONTINUED)

Sample Number	Location	PCB's (depth) (mg/kg)	Reason
S-2	process area, north, surface	27.2 (0-1")	check surface in process area
S-8	process area, east, surface	94.8 (0-1")	same
S-12	process area south, surface	17.8 (0-1")	same
S-14	process area, southwest, surface	126 (0-1")	same
S-21	roadway between 7 and 10, surface	36.2 (0-1")	same
S-56	outside gate, east, Summit Ave.	47.4 (0-1")	check surface outside fenceline
S-22	test pit 1, high PCB, southeast	3740 (13-16")	check at depth in high PCB area; southeast corner of process area
S-23	test pit 1, below high PCB, southeast	6.6 (16-24")	same
S-32	test pit 5, central process area	18.3 (10-12")	check at depth in central process area
S-34	test pit 6, near surface, southwest	71.1 (4-6")	check near surface, southwest process area
S-35	test pit 6, southwest	<5 (10-12")	check at depth, southwest process area
S-47	test pit 13, former chem. sewer lagoon	<50 (8')	volatiles present; check closed chem. sewer lagoon area at depth; oily sludge
S-48	test pit 13, former chem sewer lagoon	<5 (0-6")	check closed chem sewer lagoon area near surface

Attachment B

WESTON

28 March 1983

PRIORITY POLLUTANT ANALYSIS

Clearwater Lagoon Area; Berkeley Heights Site

Sample Preparation

One soil compsite was prepared from the below-listed already dried and sieved soil samples (reference our letter of 28 January 1983 for locations):

G-2, G-6, G-18, H-2, H-8, H-10

The composite consisted of 10 grams each of the dried, sieved soil samples.

The composite sample was analyzed by GC/MS for all priority pollutant extractables, i.e. base neutral compounds, acid compounds, pesticides, and PCB's, plus volatile organics.

Sample Results

Results of the GC/MS scan are as follows:

C_{12} and C_{14} Alcohols	100 to 1000 mg/kg (ppm)
Xylenes	present
$C_{12}H_8SO_2Cl_2$	100 to 1000 mg/kg
PCB's	> 100 mg/kg
2, 4, 6 trichlorophenol	100 mg/kg

Copies of the laboratory data sheets are attached for your information, to show those compounds included in the GC/MS scan but not detected.

WESTON

Specific comments on the results follow:

- Xylenes: The analysis for volatile organics was of limited value due to the samples already having been dried and sieved (allowing volatiles to escape). The fact that xylene was still present in detectable quantities could be indicative of a substantial in-ground concentration of xylene. Effective sampling and analysis for volatile organics requires sample collection in a small (typically 30-ml) glass "serum bottle" with crimped top, to ensure no loss of volatiles. The resultant sample is then introduced directly to the analytical equipment from this sample bottle.

- $C_{12}H_8SO_2Cl_2$: Possibly a pesticide, however positive identification was not able to be made. More background on site history and on-site chemical/pesticide usage would be helpful as an aid in identification.

- PCB's: The $>$100 mg/kg result is consistent with the fact that the composite sample was generated from six individual samples whose PCB concentrations were 10, 24, 98, 22, 1100, and 6000 mg/kg respectively.

- 2, 4, 6 trichlorophenol: Often used in fungicides, bactericides, and preservatives.

NJMO Composite

RFW 1245, 47, 49, 68, 70, 72

GC/MS FRACTION

ACID COMPOUNDS

Units of Concentration ug/l ______

mg/l ______

✓ Other mg/kg

2 Chlorophenol	
,4 Dichlorophenol	
2,4 Dimethylphenol	
,6 Dinitro-O-Cresol	
2,4 Dinitrophenol	
Nitrophenol	
4 Nitrophenol	
Chloro-M-Cresol	
Pentachlorophenol	
henol	
2,4,6 Trichlorophenol	100
ther	

NJMD Composite

RFW Sample No.

RFW 1245,47,49,68,70,72

GC/MS FRACTION

BASE/NEUTRAL COMPOUNDS

Units of Concentration ug/L ____ mg/L \ Other mg/K

$C_{12}+C_{14}$ alcohols	100-1000	Xylenes	Present
PCB's.	1450	$C_{12}H_8SO_2Cl_2$	100-100
Acenaphthene		Diethyl Phthalate	
Acenaphthylene		Dimethyl Phthalate	
Anthracene		Di-N-Butyl Phthalate	
Benzidine		2,4 Dinitrotoluene	
Benzo(a) Anthracene		2,6 Dinitrotoluene	
Benzo(a) Pyrene		Di-N-Octyl Phthalate	
3,4 Benzo-fluoranthene		1,2 Diphenyl hydrazine	
Benzo(ghi) Perylene		Fluoranthene	
Benzo (k) fluoranthene		Fluorene	
Bis (2-chloroethoxy) Methane		Hexachlorobenzene	
Bis (2-chloroethyl) ether		Hexachlorobutadiene	
Bis (2-chloroisopropyl) ether		Hexachlorocyclopentadiene	
Bis (2-ethyl hexyl) phthalate		Hexachloroethane	
4 Bromophenyl phenyl ether		Indeno (1,2,3-cd) Pyrene	
Butyl Benzyl Phthalate		Isophorone	
2-Chloronaphthalene		Naphthalene	
4-Chlorophenyl phenyl ether		Nitrobenzene	
Chrysene		N-Nitrosodimethylamine	
Dibenzo(a,h) Anthracene		N-Nitroso di-N-propylamine	
1,2 Dichlorobenzene		N-Nitrosodiphenylamine	
1,3 Dichlorobenzene		Phenanthrene	
1,4 Dichlorobenzene		Pyrene	
3,3' Dichlorobenzidine		1,2,4 Trichlorobenzene	

REFERENCE NO. 7

Statement by Commissioner Robert E. Hughey
for Millmaster Onyx/Gulf Chemical site
in Berkeley, New Jersey
July 14, 1983

We are here today to announce the sampling data that has been received for the Millmaster Onyx/Gulf Chemical site in Berkeley, New Jersey.

As background, this site was already receiving cleanup attention by the company and the Department when the question of Dioxin arose. At that time, we stopped further evaluation of the cleanup program to take additional samples at the site to test for Dioxin. Of the 25 samples taken at the site, 23 showed no detectable levels of Dioxin. One showed a trace level of .7 ppb and one sample has not yet been analyzed due to interference. Ten of the samples were newly taken under our direction and fifteen were archived samples from the information developed for the general cleanup of the site.

Based on these findings, it is our opinion that the site can be removed from the Dioxin list and that we can proceed with an appropriate cleanup program for other chemical contamination problems at the site, which include PCB's. The previous cleanup efforts have been discussed with the local officials and other elected representatives. These officials were also informed of our sampling efforts for Dioxin and have now been informed of these results and our intention to proceed with the cleanup program for the site.

REFERENCE NO. 8

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ROBERT E. HUGHEY, COMMISSIONER
CN 402
TRENTON, N.J. 08625
609 - 292 - 2885

June 3, 1983

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Edward B. Walker III, President
Gulf Oil & Chemical Co.
P.O. Box 1166
Pittsburgh, PA 15230

Re: Department of Environmental Protection
State-Wide Dioxin Survey

Dear Mr. Walker:

This will confirm our telephone conversation of yesterday between Keith Onsdorff of the Office of Regulatory Services and Mr. Dennis Caputo of Gulf Oil & Chemical Co., in which your firm agreed to cooperate fully with the Department's ongoing study of potential dioxin contamination sites in the State of New Jersey. Specifically, we will be contacting your designated technical representative(s) in the very near future to review all available data relative to your chemical manufacturing/handling activities at Berkley Heights, New Jersey, which could have resulted in the generation of and/or release of dioxin into the ambient environment.

Based upon our review of such corporate and other existing records, a sampling program will then be jointly prepared and carried out within thirty days thereafter to ascertain the presence or absence of dioxin in the soils, waters, equipment and/or structures situated on this realty.

The immediate undertaking of this comprehensive site evaluation at Berkley Heights, New Jersey has been deemed necessary in light of the inclusion of your facility in the list of Class I pesticide producers contained in a U.S. Environmental Protection Agency publication entitled Dioxins, EPA-600/2-80-197, (November 1980). This publication identified Class I pesticides as those which are highly likely to be associated with the presence of halogenated dibenzo-p-dioxins because of the presence of an ortho-halogenated phenol in the reaction sequence, with subjection to elevated temperature ($\geq 145^\circ$ C+) plus either alkalinity or the presence of free halogen.

Your cooperation in this endeavor of utmost mutual concern is appreciated. We believe that the establishment of this close working relationship again exemplifies New Jersey's national leadership in forging a constructive partnership between the public and private sectors for the enhancement of the public welfare and environmental protection.

If you wish to discuss this matter in greater detail, please contact Michael Catania, Director, Office of Regulatory Services, directly at (609) 292-9003.

Sincerely,

Robert E. Hughey

c: Mr. Dennis Caputo

REFERENCE NO. 9

CONTAMINATION ASSESSMENT REPORT UPDATE
Berkeley Heights, New Jersey

PREPARED FOR

CHEVRON CHEMICAL COMPANY

PREPARED BY

ES
ENGINEERING-SCIENCE
Liverpool, New York

DECEMBER 1986
REVISED MAY 1989

To the Reader:

In 1982, Gulf (now Chevron) discovered soil contamination at the site of a Millmaster-Onyx chemical manufacturing facility in Berkeley Heights, New Jersey. Gulf had purchased the facility a few years before as part of a larger acquisition. Following the discovery of the contamination, Gulf immediately notified state and federal environmental protection agencies. After ensuring that the site did not pose an imminent threat to the health and safety of the public, Gulf, in concert with the New Jersey Department of Environment Protection (NJDEP), began a voluntary program of site investigation and remediation.

Chevron took over the management of the project in mid-1985 following the merger of Gulf and Chevron. It is worth noting that like Gulf, Chevron has assumed responsibility for the site following a business merger. Neither Chevron nor Gulf were owners of the facility during the period when plant operation resulted in soil contamination.

In undertaking this voluntary effort, Gulf/Chevron has expended over $3 million dollars and thousands of man hours on the project. The result is a detailed assessment of the contamination at the site. This assessment, termed a Remedial Investigation (RI), is contained in this report.

Based on this site investigation, Chevron's environmental consultant will make a thorough analysis of the alternatives for site remediation. That analysis, termed a Feasibility Study (FS), will select a practical and environmentally sound solution to the concerns posed by the site.

During all of the efforts at the site both Gulf and Chevron have worked very closely with the NJDEP. The role of the NJDEP has been one of both advisor and critic. As we enter the next phase of the project, we are hopeful that we can build on the spirit of cooperation that has developed between Chevron and the NJDEP.

CONTAMINATION ASSESSMENT REPORT UPDATE
BERKELEY HEIGHTS, NEW JERSEY

Prepared For

CHEVRON CHEMICAL COMPANY
BERKELEY HEIGHTS, NEW JERSEY

Prepared By

ENGINEERING-SCIENCE, INC.
290 ELWOOD DAVIS ROAD
LIVERPOOL, NEW YORK

DECEMBER 1986

REVISED MAY 1989

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EXECUTIVE SUMMARY

Millmaster Onyx, owned by Gulf Oil Corporation (now Chevron Corp.) between 1979 and 1982, operated a specialty chemicals manufacturing plant in Berkeley Heights, New Jersey (Union County) over a period of more than 20 years. The plant was closed in 1982 and all surface structures and equipment were removed from the site. After the plant was dismantled, Gulf suspected the presence of soil contamination from visual observation on the site.

Since that time, Gulf has conducted extensive investigations to identify and quantify contaminants resulting from the Millmaster Onyx manufacturing operations. Roy F. Weston, Inc. collected samples of surface soils in 1982. At that time a security fence and erosion control berms and fences were erected at the site. Since early 1983, Engineering-Science, Inc. (ES) has been Gulf's general contractor for all site work including site investigation and remedial action.

The scope of the investigative effort can be understood by reviewing the number and type of samples collected since the on-site work was begun. The sampling program to date has included the following:

- 484 surface and subsurface soil samples were analyzed for polychlorinated biphenyls (PCBs) only;
- 418 soil samples and 12 samples of Passaic River sediment were analyzed for some or all of the priority pollutants (organic chemicals and metals);
- 18 samples of Passaic River water analyzed for PCBs and specific organics;
- 145 groundwater samples from monitoring wells and 30 samples of Passaic River water were analyzed for some or all of the priority pollutants.

In addition to the samples listed above, geophysical surveys consisting of electrical resistivity and magnetometer surveys were performed to aid in defining the site hydrogeology and to identify the potential presence of buried drums. A total of 151 borings were logged to define the subsurface geology of the site. Twenty-six of these borings were completed as monitoring wells, observation wells, or piezometers, all of which are used to measure water levels. The monitoring and observation wells are also used to monitor groundwater quality. Water quality data were also obtained from the 3 piezometers during a single monitoring event.

The hydrogeological investigation revealed two water-bearing strata on the site. The upper hydrologic unit outcrops at the ground surface, extends to depths on-site of four to 20 feet, and consists of fill material and small amounts of river alluvium. It is assumed that the fill was deposited when the plant was constructed. The second water-bearing zone is a thin, weathered rock material separated from the fill/alluvium by a thick (nine to 40 foot) layer of relatively impermeable clays termed the glacial lake deposits. This layer acts as a relatively effective barrier to downward transport of contaminants.

Water level measurements from November 1983 through August 1985 indicate artesian conditions in the deep zone for the downgradient wells except during extremely dry weather periods of short duration. Upgradient wells generally display non-artesian conditions. If any connection exists between the two water-bearing zones, water will be transferred from the deep to the shallow zone in the area beneath the site. The fill/alluvial zone disappears immediately south of the site and the fractured rock zone outcrops at the surface at approximately the same point. Thus, there is a possibility for connection of the two water-bearing zones in the area 200 to 500 feet south (upgradient) of the plant security fence.

The magnetometer and resistivity surveys were somewhat hampered by the presence of the building slabs which remain on-site. Resistivity results showed good correlation with depth to the water table and consolidated rock. The magnetometer survey indicated several anomalies, which are attributable to closed underground storage tanks, building rubble, and in one known instance only, several buried drums.

The investigations have revealed that two essentially separate contamination problems exist. Areas of the site, and formerly some land outside of the security fence, are contaminated with PCBs. The PCB contamination is a result of the rupture in a hot oil heat exchanger system which occurred in 1967, before Gulf owned the plant. An estimated 300 to 600 gallons of PCB oil (3500 to 7000 pounds of PCBs) may have leaked from the ruptured heat exchanger system. The other contamination problem is the presence of organic priority pollutants and other organic chemicals. It is the apparent result of accumulation of sludges in several lagoons (now filled-in) and the accidental spillage or leakage of raw materials and products during the active life of the facility.

Heavy metal contamination was detected in three areas during the Phase 2 investigation. Two of these areas were on-site and the other area was outside the west plant fence. The presence of heavy metal contamination was determined by comparing individual sample metal concentrations with "typical" ranges for metals in soils as found in the literature (see Appendix R of this report). The on-site areas with elevated metals levels were the Clear Water Lagoon and South Chemical Lagoon which displayed elevated metals below the surface. The area outside the west plant fence showed elevated mercury in two borings. The elevated metals were found in these borings at zero to two feet below grade (but not lower). The most likely explanation of this situation is that the elevated mercury is associated with fill dirt which was brought to this area during the interim remedial action (off-site PCB soils removal) during 1983. No elevated metals concentrations were observed in any other Phase 2 borings.

PCBs are very insoluble chemicals which tightly adhere to soil particles in clayey, organic-containing soils such as those found on the plant site. The site investigations have shown that the PCB soil contamination is confined to surface soils and three of the lagoons. Although the soils have largely attenuated the transport of PCBs, low levels of PCBs were detected in a small number of samples from shallow, mostly downgradient wells. No PCBs have been detected in the deep aquifer or in water samples from the Passaic River.

The majority of the PCB contamination is confined to the soils in the southeast corner of the site, which was the location of the heat exchanger system. The other significant PCB contamination is beneath the ground surface in the former "Clear Water Lagoon" and the "North Chemical Lagoon". This contamination in the lagoons, and the more lightly contaminated surface soils, are believed to originate from the clean-up and disposal actions of plant staff after the heat exchanger line rupture, and from movement of surface soils during the plant demolition in 1982.

Erosion of the site surface soils moved small quantities of PCB contamination to locations outside of the plant security fence. During the fall of 1983 the vast majority of these off-site contaminated soils were excavated and moved into a secure storage area inside the security fence. The small amount of contaminated soil remaining outside of the fence upon completion of the 1983 interim remedial action (which had not been excavated due to high water levels in the Passaic River) was excavated in the summer of 1985 and moved into the on-site storage facility. Some isolated contamination remains outside the west and south plant fences.

Contamination with various organic chemicals, including some priority pollutants, is somewhat more widespread than the PCB contamination. The chemicals found in the highest concentrations are ethylbenzene, xylenes, toluene, chlorobenzene, and mixed phenolics. These are present in both the soil and the shallow groundwater.

The principal areas of soil and shallow groundwater contamination are the former lagoons and the immediately adjacent areas. There is also a contaminated site in the northwest corner of the property where drums were stored and sludge from the North Chemical Lagoon was deposited. The southern and eastern boundaries of the site (as defined by the security fence) show little or no contamination of the soils and shallow groundwater.

It is somewhat difficult to differentiate contaminants in the soil from contaminants in the shallow groundwater since the water level in the shallow zone approaches the ground surface during wet weather. The contaminants found in the soils and groundwater are generally distributed along the site northern and western boundaries, which are the areas closest to the former lagoons. The shallow groundwater shows a distinct and permanent hydraulic gradient toward the Passaic River on the north and northwest. This gradient is the primary factor controlling the current distribution of organic contaminants outside of the source areas - the lagoons and the dredged material disposal site.

Groundwater flow rates were determined through in-situ permeability testing of the shallow water-bearing zone. Based on the measured permeabilities and average hydraulic gradients measured at the site, the average flow through the site is about 2,800 gallons per day. It is assumed that this flow enters the Passaic River.

Two monitoring wells installed immediately adjacent to the city sanitary sewer which bisects the site west to east indicate that some contamination is present on the east side of the plant in the bedding material of the sewer. This contamination is probably due to diffusion of the contaminants in the groundwater as recent water level measurements do not indicate a gradient along the sewer line. Upstream and downstream samples of the sanitary sewage indicate that there is no contaminated groundwater infiltration into the sewer line as it traverses the site.

The existing data suggest the deeper water-bearing zone of fractured rock is not contaminated with the organic chemicals originating in the soils and shallow groundwater of the plant site. The existing data do show sporadic occurrences of several contaminants, which may be due to sample cross-contamination from well bailers, or laboratory contamination (in the case of methylene chloride). Other compounds were either detected only in upgradient wells or were detected in higher concentrations in upgradient wells.

The conclusion which can be drawn from these data is that there are off-site sources of groundwater contamination in the area. One possibility is a former site on the Union County park land, which is located immediately adjacent to the southwest corner of the plant site and which may have been used for disposal purposes. The concentrations of these chemicals in the deep groundwater have generally been low, less than 0.1 milligrams per liter.

Upstream and downstream water samples collected in the Passaic River have never shown detectable concentrations of the contaminants found on the site. Passaic River sediment samples have also demonstrated that the specific organic chemicals found in the site soils and shallow groundwater have not migrated to an extent which results in detectable concentrations of these constituents in the sediments. Low concentrations of PCBs (0.2 and 5 mg/kg) were found in sediment samples collected from the river at a location immediately adjacent to the most contaminated areas of the site. These PCBs are likely the result of surface runoff transport of eroded soils from the site before the current runoff control system was installed in 1982.

It is concluded that although contaminated groundwater from the site is being intercepted by the river, the rate of groundwater flow is so low and the attenuation of organic chemicals in the soil is sufficiently high so that the contaminants are diluted in the river to concentrations below the applicable analytical detection limits.

CHAPTER 1

INTRODUCTION

PROJECT BACKGROUND

A former division of a subsidiary of Gulf Oil Corporation (Gulf), Millmaster Onyx, manufactured specialty chemicals and pharmaceuticals at a plant in Berkeley Heights New Jersey, over a period of more than 20 years. This subsidiary, and the plant, were purchased by Gulf in 1979. Gulf has since sold Millmaster Onyx back to its original owners, but has kept title to the particular piece of property in question. The site was initially the subject of investigation because of suspected polychlorinated biphenyls (PCB) contamination. The investigation was expanded after it was discovered that other organic contaminants were present in the soils on and adjacent to the plant site.

This report is the result of the investigations and studies performed by Engineering-Science, Inc. (ES) and Roy F. Weston, Inc. (Weston) and was first submitted to the NJDEP by Gulf (a Chevron Company) in August 1984. The information contained in the original report has been updated to reflect the results of the Phase 2 Site Investigation conducted for Chevron by ES during September, 1985.

The Phase 2 investigation was performed by Chevron to satisfy questions raised by the NJDEP in a letter to Gulf dated February 13, 1985 (See Appendix I). The NJDEP requested additional information regarding off-site contamination and the extent of contaminants in the on-site lagoons and other "hot spots". A sampling grid system was established on the plant site and thirty feet outside the west, south and east boundary fences. Sampling points were located on the grid in order to address the NJDEP's concerns relative to on-site lagoons and off-site contaminant migration. The grid system and sampling program designed to address the NJDEP's concerns about the site were incorporated in a field sampling plan submitted to NJDEP in April, 1985 and approved by the agency shortly thereafter. The provisions of the plan were carried out in September, 1985.

SITE DESCRIPTION

The plant site is located between the easement of Plainfield Avenue and Summit Avenue, north of McClellan Street (Union County park land) and south of the Passaic River in Berkeley Heights, New Jersey. Berkeley Heights is located in Union County.

The buildings at the plant site were demolished in May and June of 1982, and the debris removed. At that time a security fence was erected around the site. Somewhat later Weston installed a series of erosion control devices around the site perimeter to prevent migration of the soils to off site areas. The site contains several former lagoon areas that were used for water impoundment. During the life of the plant several of these areas were filled in with soil and in some cases buildings with concrete slab foundations were constructed over some of the areas. The principal areas of concern are a former clear water lagoon, chemical sewer lagoon, chemical lagoons, product storage area and heat exchanger area. There is also one documented case of sludge burial on the site (Dredged Material Disposal Area). The site layout and areas of concern are shown on Figure 1.1.

CLIMATE

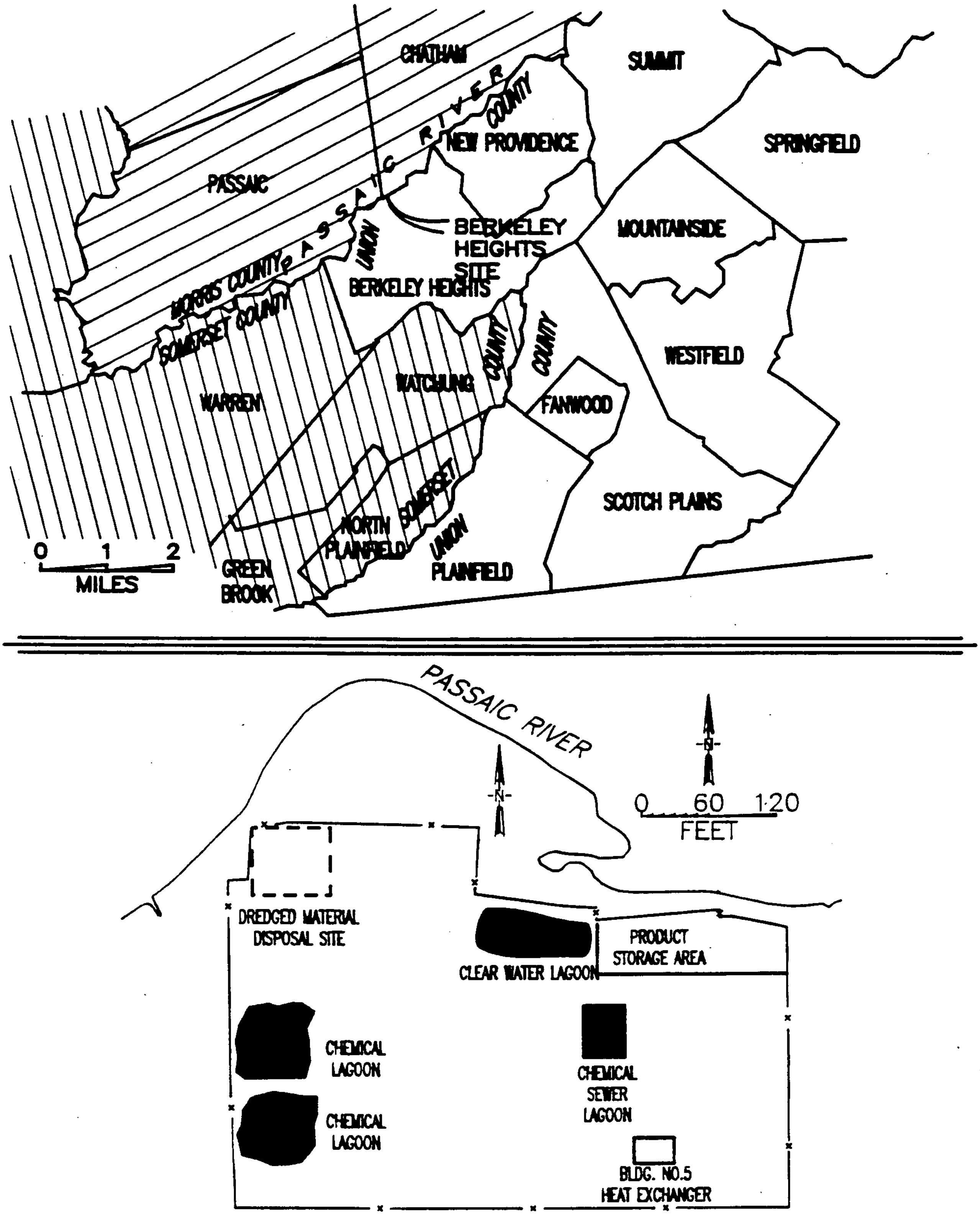
Mean annual precipitation for the study area is reported to be 46 inches, according to the Climatic Atlas of the United States, published by the National Oceanic and Atmospheric Administration, 1977. Net annual precipitation (i.e., water potentially available for infiltration) is calculated to be 14 inches, based upon a Class A pan evaporation of 42.5 inches and a 75 percent evaporation coefficient.

PHYSIOGRAPHY

The study area lies within the Piedmont physiographic province which is characterized by broad undulating lowlands interrupted by closely-spaced, narrow, southwest-northeast trending ridges. The site is situated in a narrow valley between two of the ridges, Long Hill to the north and the Second Watchung Mountain to the south. Study area relief is approximately 200 feet, measured from the Passaic River valley to the continuous crest of Long Hill. Relief across the site is only about three feet, as the area was modified by filling to facilitate plant construction. Maximum site relief is approximately 10 feet immediately adjacent to the Passaic River (See Appendix L). The floodplain of the Passaic beneath the site is relatively level.

FIGURE 1.1

SITE LOCATION MAP



DRAINAGE

Study area drainage is accomplished by overland flow in a generally northward direction through the site to swales or ditches and finally to the Passaic River, which forms the north site boundary. Flow in the Passaic River is directed northeastward. A small (probably ephemeral) tributary of the Passaic exists some 300 feet west of the site. Its flow is generally northward to the major stream. Both the unnamed tributary and the Passaic have become entrenched into the glacial lake deposits as varved clays are conspicuously exposed and some stream sections were observed to possess near vertical banks.

CULTURAL FEATURES

Two man-made features have been identified at the site which impacted the hydrogeologic study. Based upon surveyor's drawings and dimensions, it is estimated that approximately seventy percent of the site is paved. Most rainfall, therefore, does not have an opportunity to infiltrate and is directed away from the site as runoff, unless captured by dikes or berms.

The second major feature is the sanitary sewer that extends west to east through the site in the former River Road right-of-way (see Figure 5.5). The sewer was constructed into the fill zone immediately underlying the site. Typically, large-diameter sewers are aligned in a trench by use of a sand or gravel bed and backfilled with excavated materials.

CHAPTER 2

HYDROGEOLOGIC FIELD WORK

STUDY OBJECTIVES

The objectives of the initial hydrogeologic investigation were as follows:

- Define site-specific geologic conditions.
- Determine the continuity of unconsolidated geologic units present on-site.
- Delineate the aquifer(s) or zone(s) of interest from which groundwater quality samples might be collected.
- Provide a basic characterization of the aquifer(s) or zones(s) of interest.
- Design and install a permanent monitoring system.
- Obtain representative groundwater quality information.
- Provide the basis for a final remedial action plan.

The Phase 2 investigation was conducted by Chevron (Gulf) in order to answer questions raised by the NJDEP in a letter to Gulf dated February 13, 1985 (see Appendix I). The objectives of the Phase 2 investigation were:

- Obtain additional physical information relative to site features including the extent of lagoons and depth of fill material on site.
- Further define the direction of groundwater movement by installation of three piezometers, two observation wells and up to four monitoring wells.
- Obtain additional data on the extent and nature of contamination both on and off site.

STUDY SCOPE - PHASE 1

The Phase 1 hydrogeologic investigation consisted of four sequential tasks: (1) definition of site geology, (2) design and installation of a permanent monitoring system, (3) groundwater quality sampling and analyses, and (4) preparation of a formal report. The work elements conducted as part of this project include the following:

- Review of available professional literature relevant to the study.
- Drilling of four standard test borings.
- Installation of observation wells.
- Geophysical study.
- Installation of permanent groundwater quality monitoring wells.
- Sampling and analyses.
- Data evaluation and report.

Literature obtained as a part of this study provided the basis for planning on-site work. This material includes geologic reports, a groundwater study and an engineering soils report. Of particular importance was a U.S. Geological Survey (USGS) folio (Darton et al., 1908) based upon mapping performed before the study area was altered by site use modifications.

SITE WORK - PHASE 1

Phase 1 site work commenced on September 20, 1983, with the drilling of four standard test borings using the hollow-stem auger method. One boring was advanced at each of the site's four corners. Sampling was performed on a continuous basis from ground surface to refusal (presumed to be bedrock) by use of the standard penetration test, ASTM D-1586, and by undisturbed sampling, method ASTM D-1587-67. The dry drilling method (i.e., no use of drilling fluids) permitted the quick delineation of water-bearing zones as work progressed. Two additional shallow test borings were advanced in an area adjacent to the Passaic River where electrical resistivity soundings detected an anomaly. The borings were performed in order to obtain sufficient information required to resolve this subsurface discrepancy. The test borings provided detailed site-specific information at the locations where they were drilled. The locations of the four corner borings (0-1 through 0-4) and the two shallow borings (TB-1 and TB-2) are shown on Figure 2.1. The South Chemical Lagoon was also investigated in Phase 1 (see Chapter 5 for details).

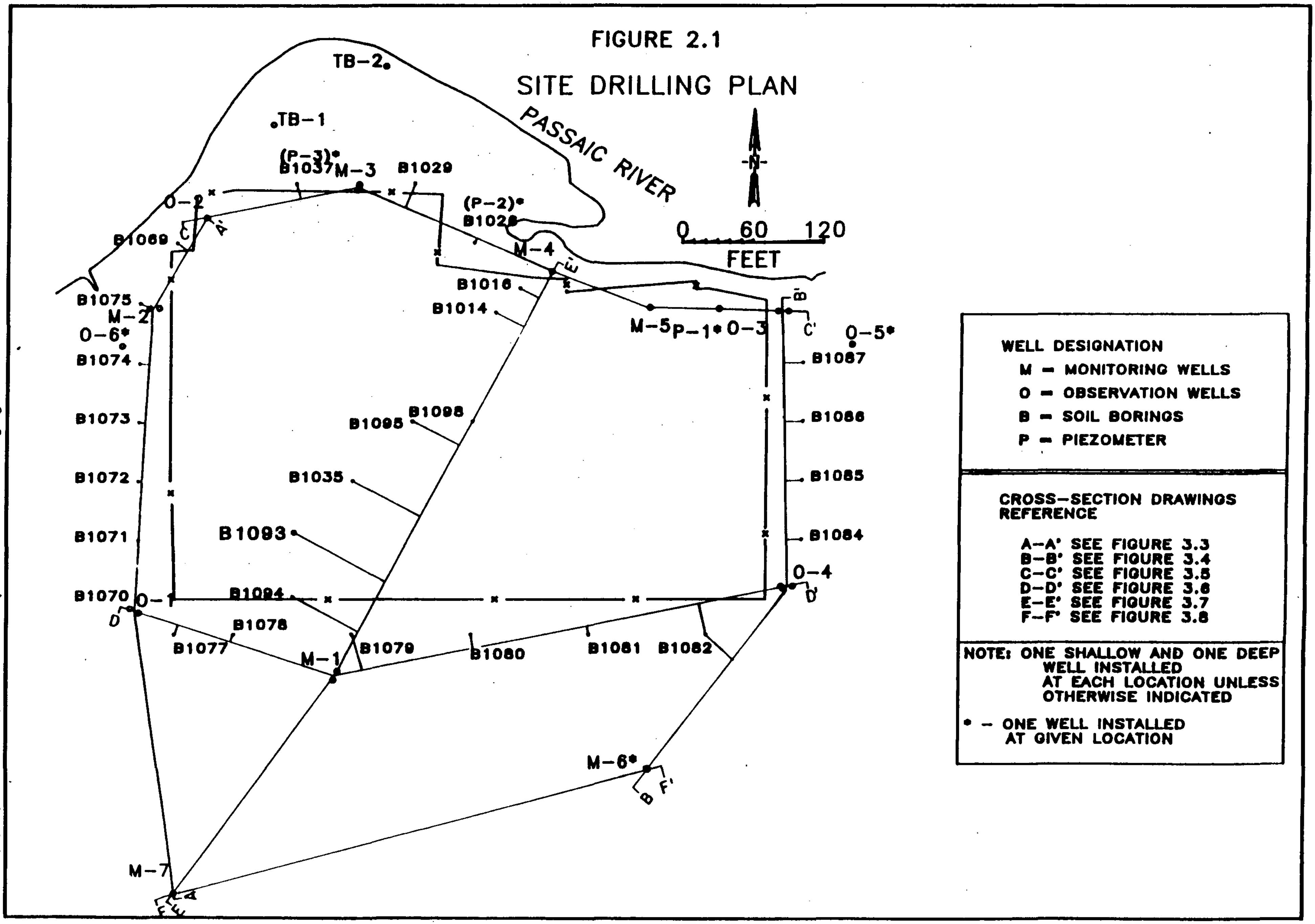


FIGURE 2.1
SITE DRILLING PLAN
PASSAIC RIVER
N
0 60 120
FEET
TB-2
TB-1
(P-3)*
B1037
M-3
B1029
(P-2)*
B1028
O-2
A'
B1069
C
M-4
E'
B1016
B1014
B1075
M-2
O-6*
B1074
M-5
P-1*
O-3
B'
C'
O-5*
B1087
B1073
B1095
B1098
B1086
B1072
B1035
B1085
B1071
B1093
B1084
O-4
B1070
O-1
B1094
D
D'
B1078
B1077
B1079
M-1
B1080
B1081
B1082
M-6*
B
F'
M-7
A
E
F
WELL DESIGNATION
M – MONITORING WELLS
O – OBSERVATION WELLS
B – SOIL BORINGS
P – PIEZOMETER
CROSS-SECTION DRAWINGS REFERENCE
A-A' SEE FIGURE 3.3
B-B' SEE FIGURE 3.4
C-C' SEE FIGURE 3.5
D-D' SEE FIGURE 3.6
E-E' SEE FIGURE 3.7
F-F' SEE FIGURE 3.8
NOTE: ONE SHALLOW AND ONE DEEP WELL INSTALLED AT EACH LOCATION UNLESS OTHERWISE INDICATED
* – ONE WELL INSTALLED AT GIVEN LOCATION

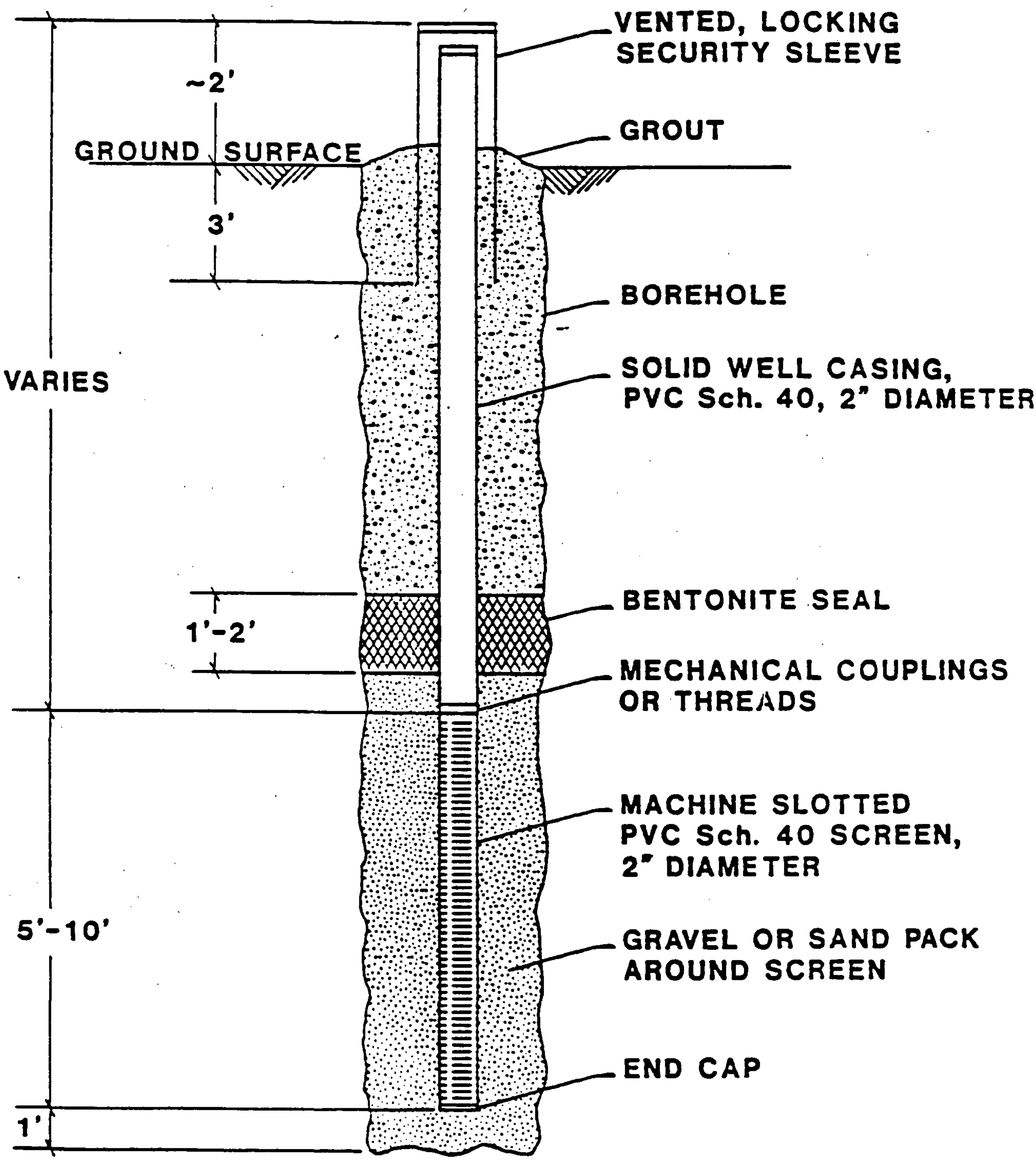
After completion of the corner borings, observation wells were installed at the boring locations. Initially, observation wells were to have been constructed by a field-expedient method utilizing glued joints, hand-slotted screens, and borehole cutting as backfill. Also, only one observation well was to have been installed per drilling location. At the request of New Jersey Department of Environmental Protection (NJDEP), observation wells were constructed to permanent well standards using 2-inch PVC pipe, threaded joints, machine-slotted screens, and bentonite-cement slurry backfill applied under continuous pressure into the annular space between the borehole wall and the well assembly. A sand pack and a bentonite pellet seal were provided to protect well screens. Since two water-bearing zones were identified at the site, NJDEP further requested that independent monitoring be provided for each of the two zones of interest. Therefore, two observation wells were installed at each location. A shallow well was constructed to monitor water levels in the first identified zone of permanent saturation (i.e., uppermost aquifer) and a deeper monitoring well was installed in the previously completed test boring to monitor water levels in the deeper zone and to evaluate a possible connection between the two zones. A typical observation well construction drawing is presented as Figure 2.2. (Actual construction details for each well are presented in the report appendices).

A geophysical study consisting of electrical resistivity (ER) and magnetometer (MG) surveys was conducted. The ER survey included various locations beyond the site perimeter fence to determine the continuity of site geologic conditions, and to delineate significant discontinuities. Information from the survey was used to guide further site work. The ER survey results are discussed in detail in Appendix A. The MG survey was performed on a grid system to determine if buried objects were present on-site. Because much of the study area is paved, on-site work was limited to former lagoon areas where pavement is absent. The grid system was tied to the site coordinate system, permitting the contouring of subsurface data. The MG survey results are also discussed in detail in Appendix A.

In brief, the ER results showed good correlation with the depth to the water table and consolidated rock but direct correlation with the depth to clay, silt and sand layers was not possible. ER horizontal profile measurements indicated anomalies on the "peninsula", on the north slope (essentially corresponding to the subsequently confirmed contaminant plume) and in the area of the possible dump site (west of the site). The anomaly on the peninsula was later determined to be due to changes in subsurface lithology. The magnetometer (MG) survey indicated the presence of buried material in the vicinity of the CWL, CSL, and chemical lagoons as well as several other areas on-site. Several anomalies correspond to underground storage tank locations. Underground storage tank information is contained in Appendix T. Several unmarked, bent and corroded drums were uncovered during Weston and ES Phase 1 test pit excavations

FIGURE 2.2

TYPICAL OBSERVATION WELL CONSTRUCTION



near the Chemical Sewer Lagoon. Drum locations and contents are discussed in detail in the Chemical Sewer Lagoon section in Chapter 5, with analyses of drum contents in Tables 5.3 and 5.4. These are the only incidents of buried drums discovered on-site during the Phase 1 and Phase 2 investigations. Other anomalies may have been caused by building rubble buried during demolition or pipes.

Following completion of the geophysical study, a groundwater surface contour map was developed for each of the two water-bearing zones to determine the direction of groundwater flow in each zone. Based upon this information, locations of additional permanent monitoring wells were selected in the field on October 6, 1983 by representatives of the NJDEP and ES. The locations of the additional monitoring wells are shown on Figure 2.1 and are designated as M-1 through M-5. Installation of the remaining system commenced immediately. The field investigative program is described in greater detail in Appendix B.

The permanent monitoring system initially consisted of ten (10) four-inch diameter PVC wells installed at five selected locations around the site. At each location, one well was installed in the shallow aquifer and a second was constructed into the deeper aquifer. The complete monitoring system is discussed in greater detail in Chapter 4. "As built" drawings of each of the first 10 permanent monitoring wells constructed for this project are included in Appendix C.

After the wells were constructed, development was accomplished by pumping until the discharge was relatively clear. The wells were further prepared by bailing. Sampling was accomplished under the supervision of NJDEP personnel using dedicated Teflon bailers. Temperature, conductivity and pH were determined in-situ. Samples were preserved and promptly transported to the designated analytical facility. A detailed description of sampling and analysis procedures is included in Appendix D. Technical specifications for the performance of test borings are included in Appendix E.

STUDY SCOPE - PHASE 2

The Phase 2 hydrogeologic field work consisted of completion of 106 test borings (located both on and off site), collection of soil samples from the borings for chemical analysis and supplementing the existing monitoring system by installation of additional monitoring and observation wells.

FIELD WORK - PHASE 2

Phase 2 site work commenced on September 5, 1985. Two mobile B61 drill rigs performed borings and installed monitoring and observation wells and piezometers. The locations of all borings, wells and piezometers installed during the Phase 2 investigation are shown in Chapter 5. Chemical samples were collected from borings at various depths (the reader is referred to the "Phase II Site Investigation Supplemental Sampling Plan" for details) by advancing a hollow stem auger to the required depth and driving a split spoon sampler into undisturbed material with blows from a 140 lb. hammer. The exact procedure used for collecting these "undisturbed" samples conformed to ASTM standard D1586(84), a copy of which may be found in Appendix J.

Two observation wells (2-inch diameter) were completed at either end of the sanitary sewer line which passes through the site proper in the old river road easement. Each of the observation wells was completed adjacent to a manhole in the sewer line and into the bedding material surrounding the pipe. From observations made during completion of borings 0-5 and 0-6, this bedding material was not found to be significantly different (physically) from the surrounding soil. These two wells are designed to allow sampling of the area immediately around the sewer pipe to determine whether contaminants are moving along the bedding material and off the site. Water quality samples were collected from all wells (new and existing) during the week of November 18, 1985. The results of this sampling are given later in this report.

Three piezometers were constructed along the northern perimeter of the site between existing monitoring wells. The piezometers are two-inch diameter PVC and differ from the monitoring wells in that no bentonite seal was used in the piezometer installation. Piezometer P-1 is located between existing wells 0-3 and M-5 inside the plant fence. Piezometer P-2 is between M-4 and M-3 outside the north fence. Piezometer P-3 is located between M-3 and 0-2 and is also outside the plant fence on the north. These piezometers are designed primarily to obtain water level readings.

Three monitoring wells (four inch PVC) were installed as part of the Phase 2 investigation. Two of the wells were located approximately 240 feet south of the southern site boundary along a southerly extension of the west fence line. This location is referred to as M-7. Both the upper (shallow) and lower (deep) aquifers were found to be present at this location and one well was completed into each aquifer. The other monitoring well (M-6) is located about 150 feet south of the southern site fence and about 120 feet west of Summit Avenue. The upper (shallow) aquifer was not present at this location as the residual soil/weathered rock (deep aquifer) was encountered at approximately 15 feet below the ground surface. The glacial lake deposits were encountered at this location approximately two feet below the ground surface. Figure 2.1 shows the locations of M-6 and M-7.

CHAPTER 3

GEOLOGY AND SOILS

AREA SURFACE SOILS

Surface soils at the site have been broadly mapped and described by Rogers et. al. (1952) and the information presented in this section is based upon these data and maps. The soils present at the Berkeley Heights Site consist of two general classes, recent alluvium and glacial soils (Rogers, 1952). Figure 3.1 depicts the estimated distribution of the site soil units based upon an engineering soil map prepared by Rogers. However, site specific boring log information indicates that the surface soils previously mapped by Rogers at the site are covered by a 2 to 12 foot thick fill layer. This fill layer was probably placed in the study area to improve the site conditions prior to construction of the plant facility.

Recent Alluvium

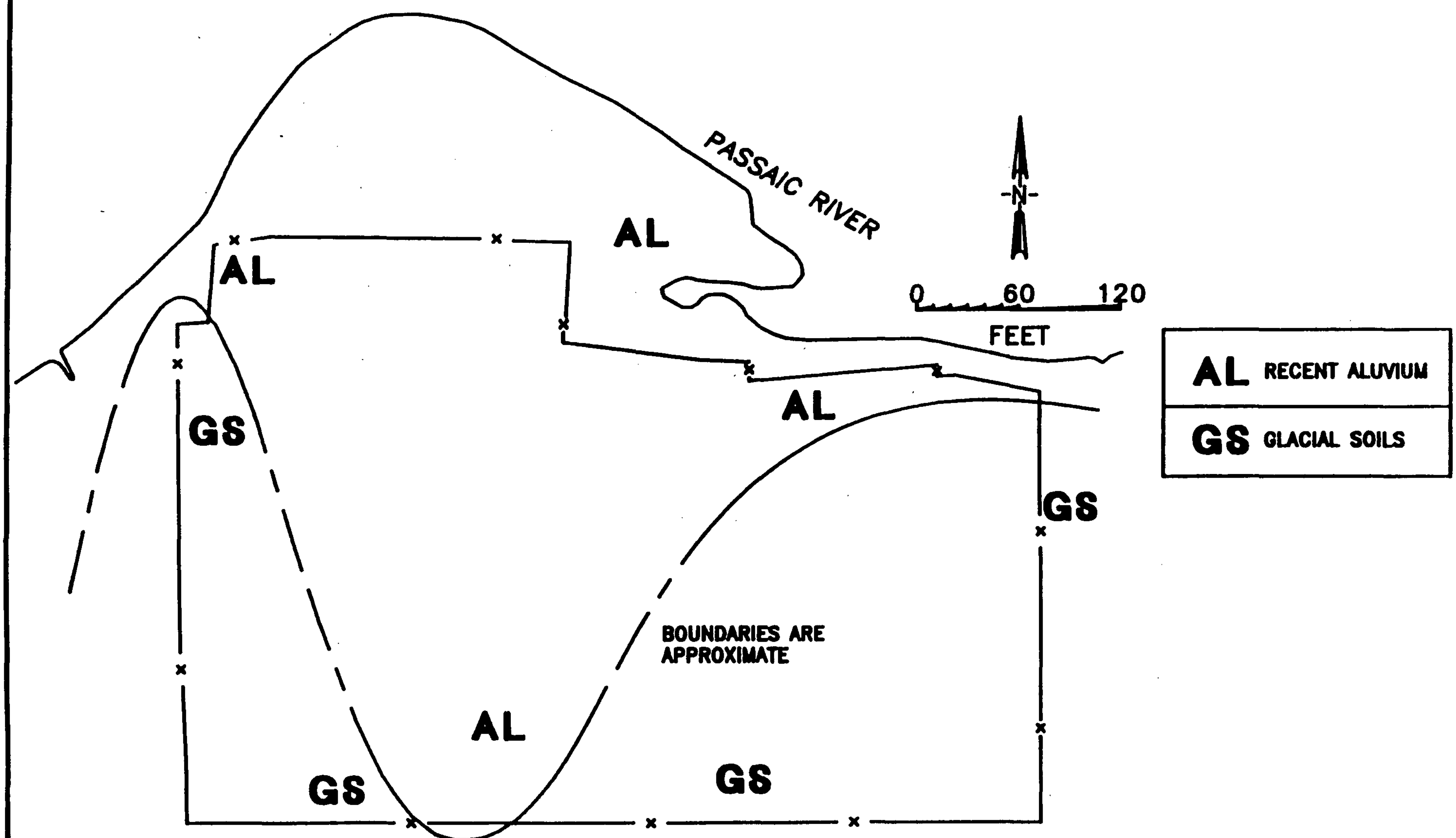
Recent alluvium occurs as a narrow band approximately parallel to the course of the Passaic River with a lobe extending southward through the site. The alluvium has been reported to be a poorly sorted accumulation of clay, silt, sand and trace gravel which is highly variable over short distances (Rogers, 1952). Locally, sorting may be described as "good" in small areas along the Passaic River. Typically, the recent alluvium at the site consists of silt with appreciable amounts of clay and organic matter and locally, alternating depositional cycles have produced an appearance of stratification. Because of its variability, the engineering properties of this unit have not been estimated, but surface drainage has been reported to be poor (Rogers 1952).

Glacial Soils

Glacial soils from the second soil unit present in the study area. This unit consists of glacial lake and/or nonresidual materials deposited as a result of glacial activity. This unit is overlain by fill in higher elevations of the site and overlain by the recent alluvium in lower areas adjacent to the Passaic River. Based upon site specific boring information, the glacial lake deposits have been found to consist of relatively homogeneous materials with particle sizes ranging from clay and silt to medium fine sand. The unit varies in thickness at the site from approximately 10 to 40 feet.

FIGURE 3.1

DISTRIBUTION OF STUDY AREA SURFACE SOILS



ES ENGINEERING-SCIENCE

AREA GEOLOGY

Study area bedrock geology is dominated by consolidated sediments of the late Triassic Brunswick Formation of the Newark Series (Lewis and Kummel, revised 1950). The Brunswick consists of an interbedded association of soft red-brown shale, mudstone, and sandstone (Schuberth, 1968; Van Houten, 1969; and Wolfe, 1977). The unit occurs as the fill of an elongate basin some 20 miles wide which extends southwest to northeast across the Passaic Quadrangle (includes parts of Morris, Passaic, and Union Counties). Total unit thickness is estimated to be on the order of 10,000 feet (Schuberth, 1968). Generally, the unit strikes northeast and dips west or northwest at angles of 10 to 15 degrees. In the Watchung Mountains area, a low syncline is present in the unit with numerous minor flexures (Darton et al., 1908). Extensive faults traverse the Newark rocks, primarily along strike; downthrow to the east is indicated. Igneous intrusions through the Newark rocks have created the subparallel series of Watchung ridges. Nemickas (1974) has mapped the Brunswick rock surface using well drilling information. In the vicinity of the subject site, bedrock, or the upper Brunswick surface, is estimated to occur between 160 to 180 feet mean sea level. The bedrock surface apparently slopes northwest in the vicinity of the site. Northeast, toward Summit, the bedrock surface dips sharply in an elongate trough to 20 feet mean sea level (MSL), creating a narrow, steeply dipping feature called the Summit Valley.

Study area surficial geology is dominated by Pleistocene deposits of Glacial Lake Passaic (Darton, et al., 1908; Schuberth, 1968; Wolfe, 1977; and Harper 1983). At one time, the Berkeley Heights area was situated within the limits of the former lake, which at its maximum extent, was some 30 miles long, 8 to 10 miles wide, and reached a depth of 240 feet. A total of approximately 80 feet of fine-grained sediments was deposited on the lake bottom. Many of the glacial lake deposits exhibit seasonal banding termed "varves" (called "laminates" by Darton, et al., 1908) and are commonly described as varved clays. A varve consisting of one year's deposition includes a layer of clay or silty clay and a layer of silt. They are usually set off from one another by slight color and texture changes which facilitate recognition. Samples obtained by driving a split spoon through the varved clays possess this banding and separate along the silt layer with some difficulty when samples are pulled apart. This deposition is predominantly horizontal, however, an exposure of these materials just northeast of the site's security fence (at the end of Summit Avenue along the Passaic River embankment) dips southwest, suggesting the possibility of local slumping. The varved clays are thought to be some 40 feet thick near the Passaic River where the depth to bedrock is greatest and become progressively thinner to the south (uphill from the site). Darton, et al. (1908) mapped "bedrock" along the crest of the hill immediately south of the site. This was not in evidence during the on-site work, as much of the study area has been altered by site use modifications such as filling and grading. Figure 3.2 is a geologic map modified from Darton, et al. (1908) which depicts these features relative to the site's location.

Based upon interpretations of the data collected to date, a description of site subsurface conditions was prepared. Material descriptions were obtained by visual inspection and field identification procedures. This information is illustrated as geologic sections in Figures 3.3 through 3.8 (see Figure 2.1 for key map). It must be noted that while a geophysical survey may suggest the continuity of materials encountered between boring locations, some variation could occur locally. The location of these geologic sections is shown on Figure 2.1.

The materials encountered include topsoil, fill, modern alluvium, glacial lake varved clays, and residual soil (i.e., weathered bedrock). A description of each unit follows.

Topsoil

A thin veneer of topsoil was encountered at ground surface at TB-1, TB-2 and M-2. The material is associated with the growth of vegetation along the Passaic River and consists of two inches to one and one-half foot thickness of sandy clayey silt with organic fibers, roots, etc. One-half foot of topsoil was also encountered below one-half foot of road fill at M-1.

Fill

The fill layer underlies the entire plant site. The fill extends to a point at least 30 feet west and 50 feet north of the security fence. The fill appears to underlie the Union county park land south of the site where debris is exposed at ground surface. The fill, a man-made stratum of fine to medium sand, silt, clay, gravel, cinders, metal, etc., varies in thickness from 4 feet at 0-3 to greater than 20 feet in the Chemical Sewer Lagoon (CSL), North Chemical Lagoon (NCL), South Chemical Lagoon (SCL), and Clearwater Lagoon (CWL). It was not found to be present in areas immediately adjacent to the Passaic River. The fill layer was most likely placed to "improve" the study area prior to construction and to raise site grades out of the Passaic River floodway. The origin of the fill may include construction debris, alluvium, colluvium, etc.

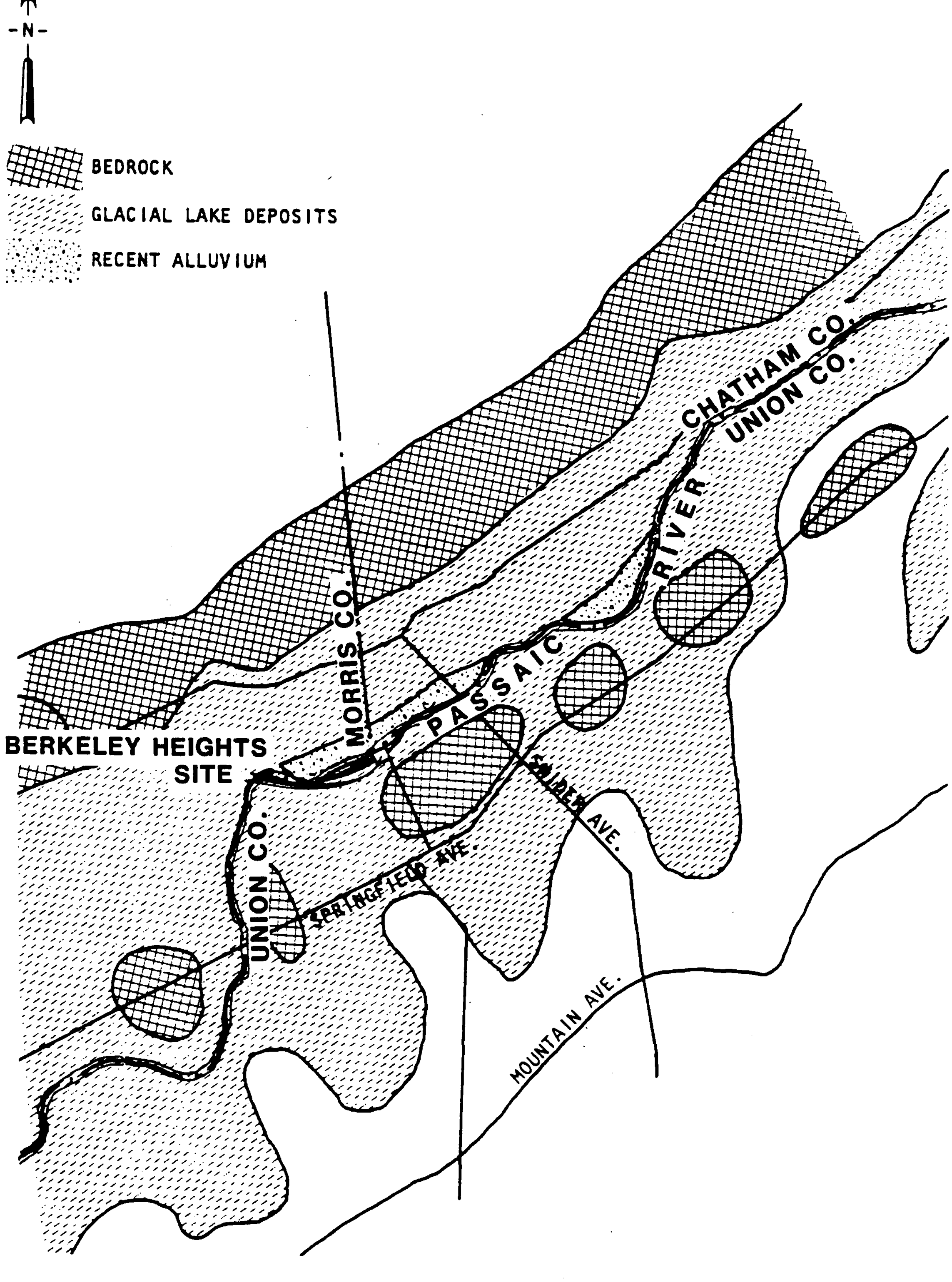
Recent Alluvium

Recent alluvium, associated with the evolution of the Passaic River, was encountered in the triangle formed by the southwest, northwest and northeast corners of the site. It was also encountered in the "peninsula" just north of the site adjacent to the Passaic River. Thickness of the alluvium generally increased from south to north except along a line from the CWL to the southwest plant corner. Boring B1078 outside the south fence showed up to ten feet of alluvial

ES ENGINEERING-SCIENCE

FIGURE 3.2

GEOLOGIC MAP



SOURCE: Darton, et al., 1908.

FIGURE 3.3

GEOLOGIC CROSS-SECTION A–A'

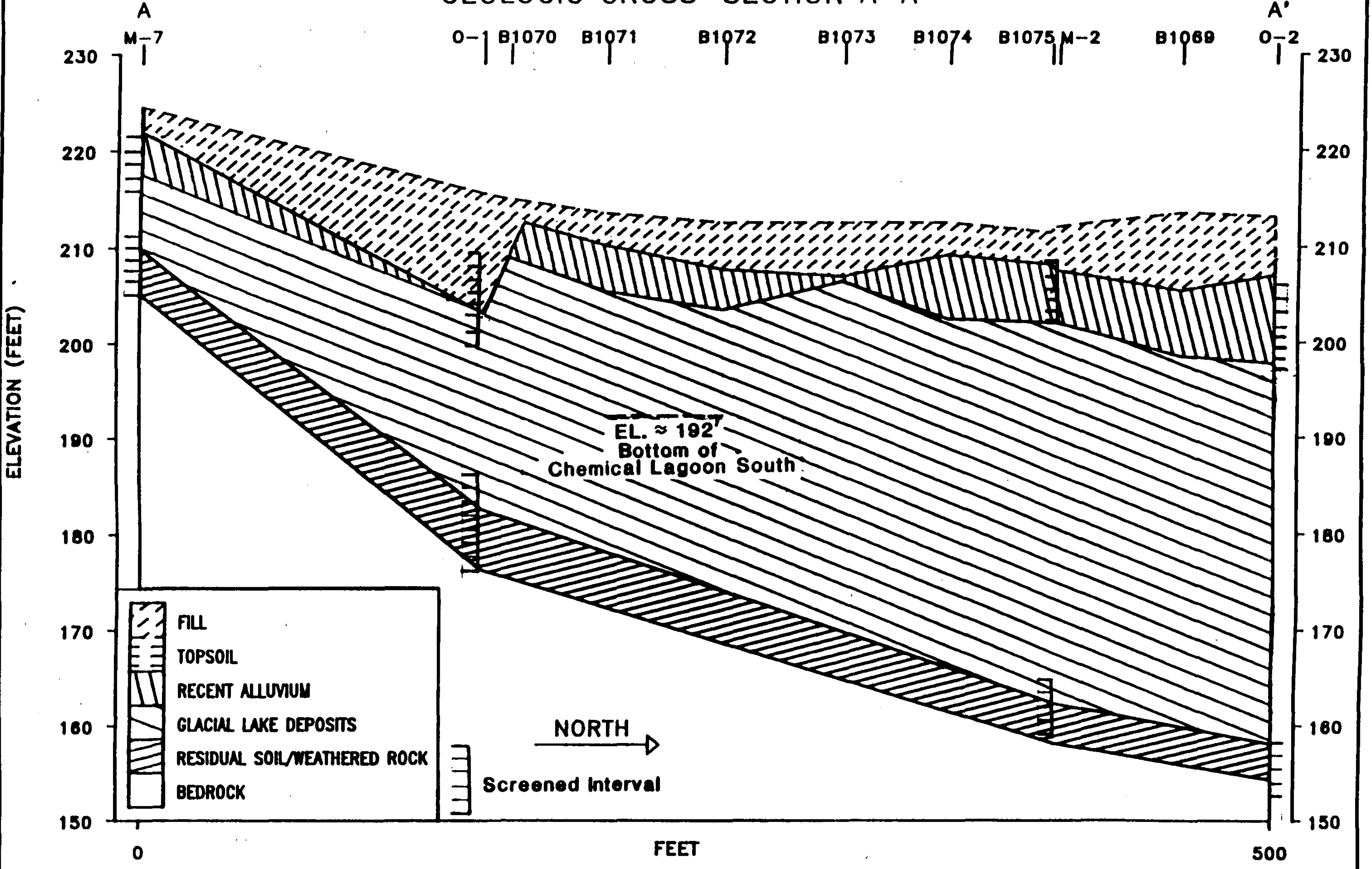
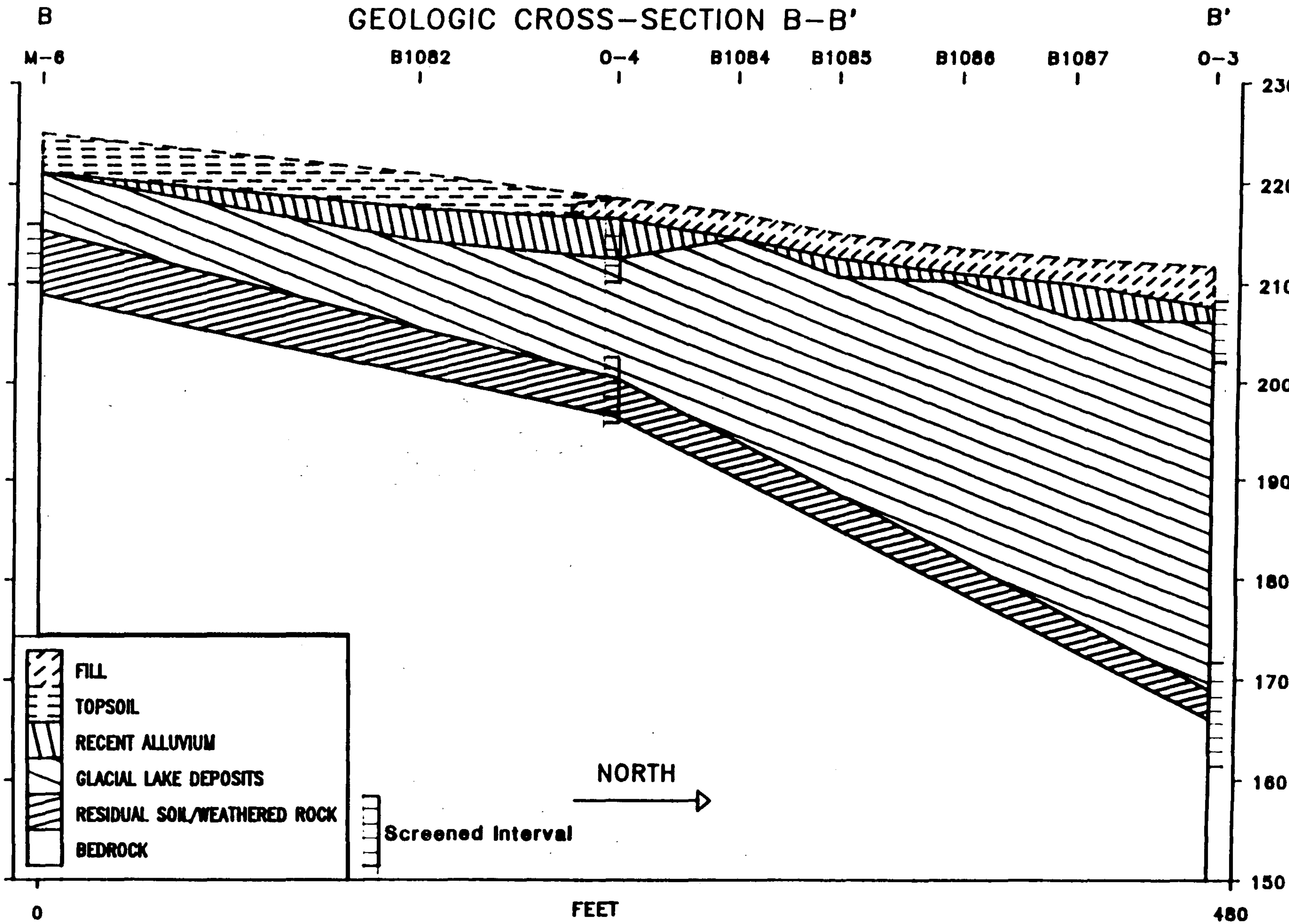


FIGURE 3.4

GEOLOGIC CROSS-SECTION B-B'



ENGINEERING-SCIENCE

FIGURE 3.5

GEOLOGIC CROSS-SECTION C–C'

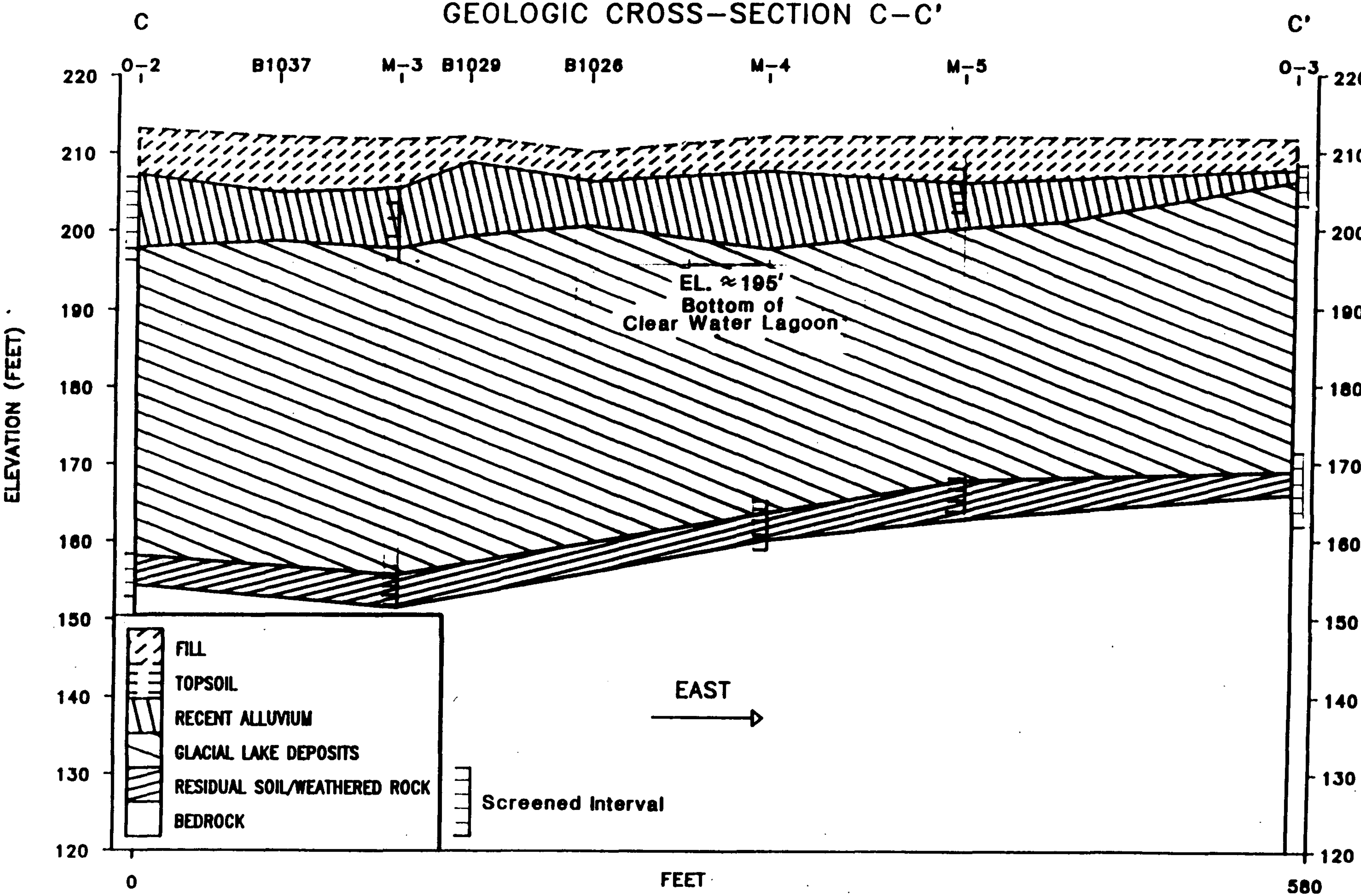


FIGURE 3.6

GEOLOGIC CROSS-SECTION D-D'

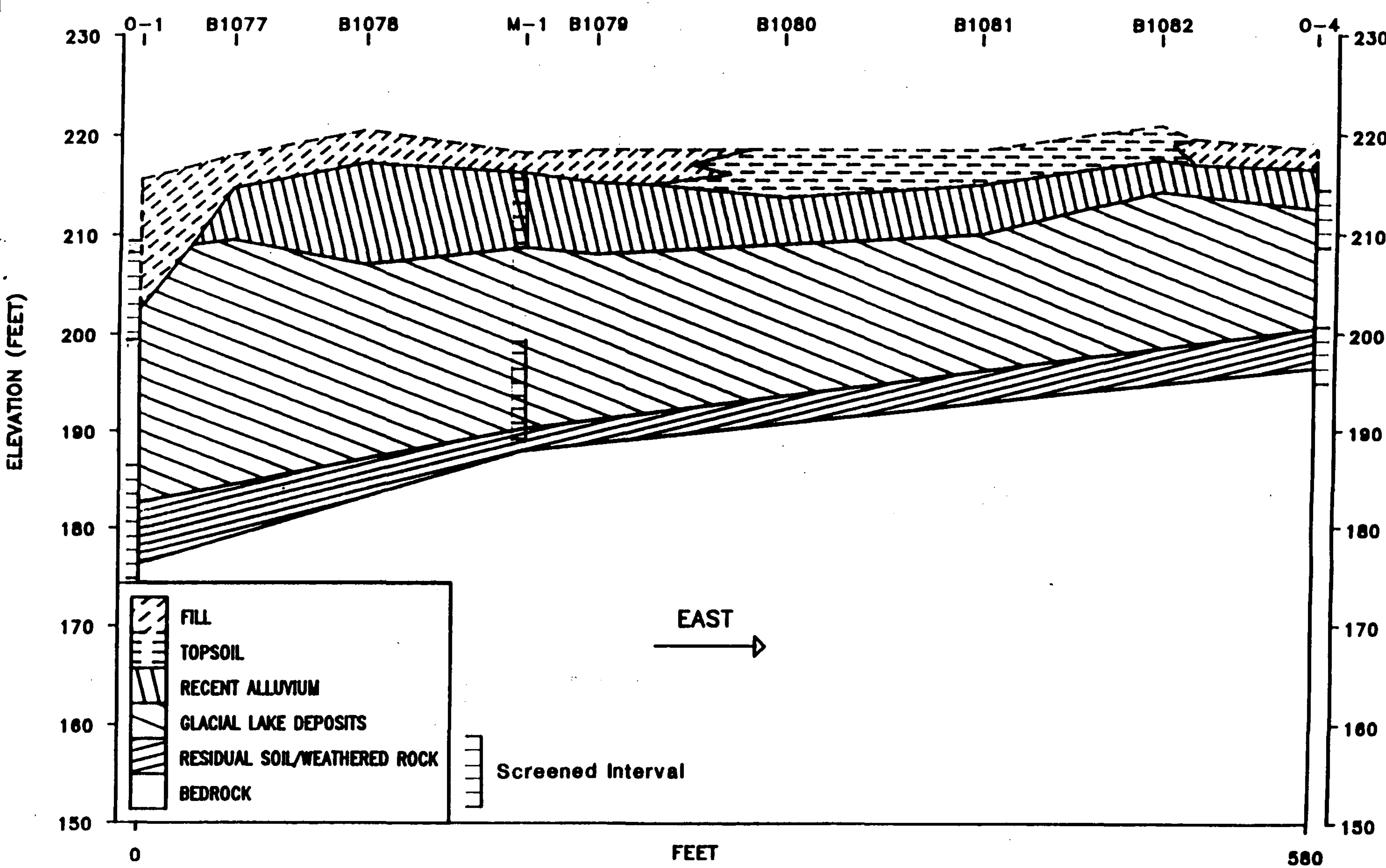


FIGURE 3.7

GEOLOGIC CROSS-SECTION E-E'

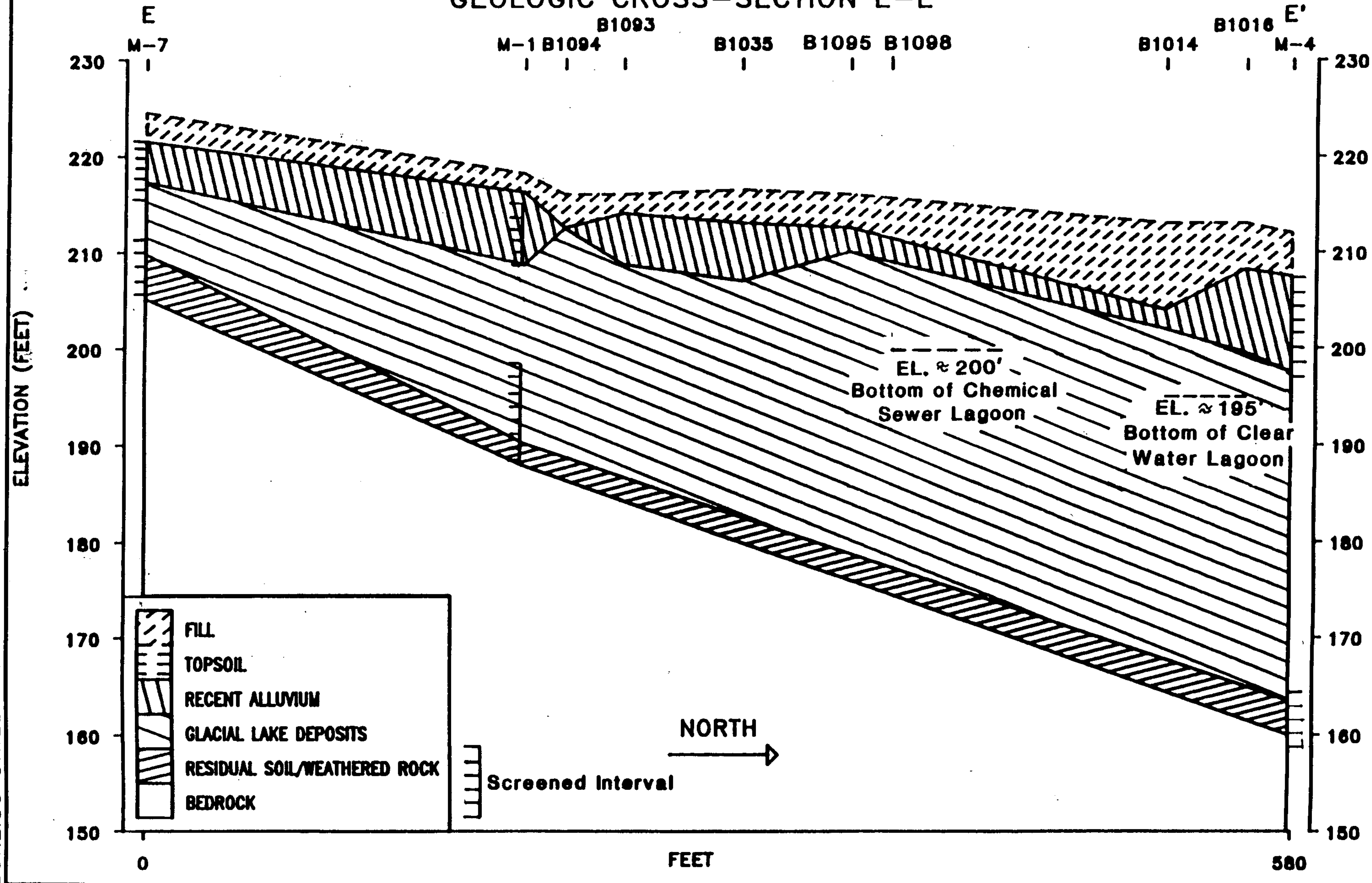
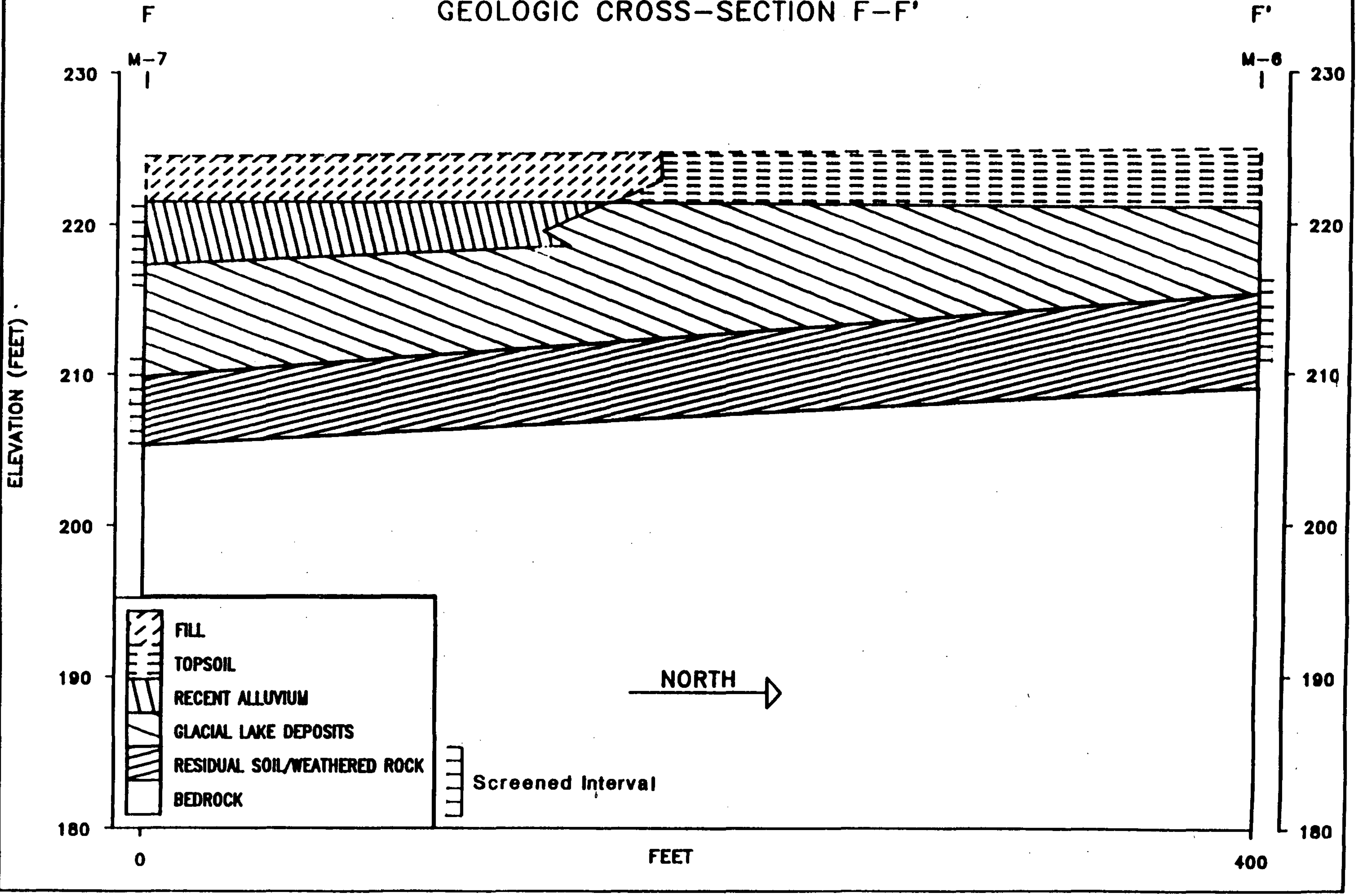


FIGURE 3.8

GEOLOGIC CROSS-SECTION F-F'



deposits. Most of the alluvial deposits encountered were saturated to wet depending on their depth below the surface and proximity to the glacial lake clays. The alluvium consists of stratified medium to fine sand, silty fine sand, silt, silty clay, and clay. The alluvium is primarily a fine-grained material, which is consistent with the apparent competence of a slow moving stream such as the Passaic River. Organic materials may be present locally. This unit occurs immediately beneath the fill layer in the main site area and beneath the topsoil zone in the river floodplain. The unit varies in thickness from one and one-half feet at 0-3 to 17 feet at M-4 in the floodplain of the Passaic River. The unit was not encountered at borings advanced at the southeast corner of the site. Due to its similarity with the fill stratum, some difficulty was experienced in determining the point at which the fill terminated and the alluvium began.

Glacial Lake Deposits

Glacial lake deposits, consisting of silty clay, clay, silt, and fine sandy clayey silt were encountered at all boring locations. The material was typically varved, with one-inch to six-inch thick clay or silty clay layers separated by a one-quarter to one-half inch thick seam of silt or fine sandy clayey silt. Deposition appears to have occurred at or near the horizontal. The material appeared to be plastic and cohesive. Samples separated with difficulty only along thin silt seams. Penetration resistances were usually 10 blows or less per foot of sampler penetration. Undisturbed sample tubes (three-inch diameter by 30-inch length) were pushed with relative ease in this unit. The unit varied in thickness from 6 feet at M6 to 39.75 feet at M-2 and is apparently continuous beneath the site.

Residual Soil/Weathered Rock

Residual soil (weathered rock) was encountered beneath the glacial lake deposits at all monitoring well and Phase 1 observation well locations. This stratum has developed by the weathering of the parent bedrock, the Brunswick Formation. This unit possesses a characteristic bright red-brown color and is comprised of very stiff clayey silt, clayey sandy silt, silty sand, and sandy clay with numerous coarse sand and fine to medium gravel particles (shale fragments) present. This stratum is relatively thin, ranging from a thickness of 2.3 feet at M-1 to 5.7 feet at 0-1. The unit was clearly distinguishable from overlying materials as sampler penetration resistances were significantly higher, in some cases exceeding 100 blows per foot. The lower limit of this unit and the top of the underlying bedrock were suggested by sampler refusal. The elevations at which sampler refusal was encountered at all boring locations is roughly consistent with the elevations postulated to correspond to the top of continuous rock (from Nemickas, 1974 and 1976). A contour map of the bedrock surface is presented as Figure 3.9. This map shows a dip toward the north-northwest in the site vicinity.

FIGURE 3.9
BEDROCK CONTOUR MAP

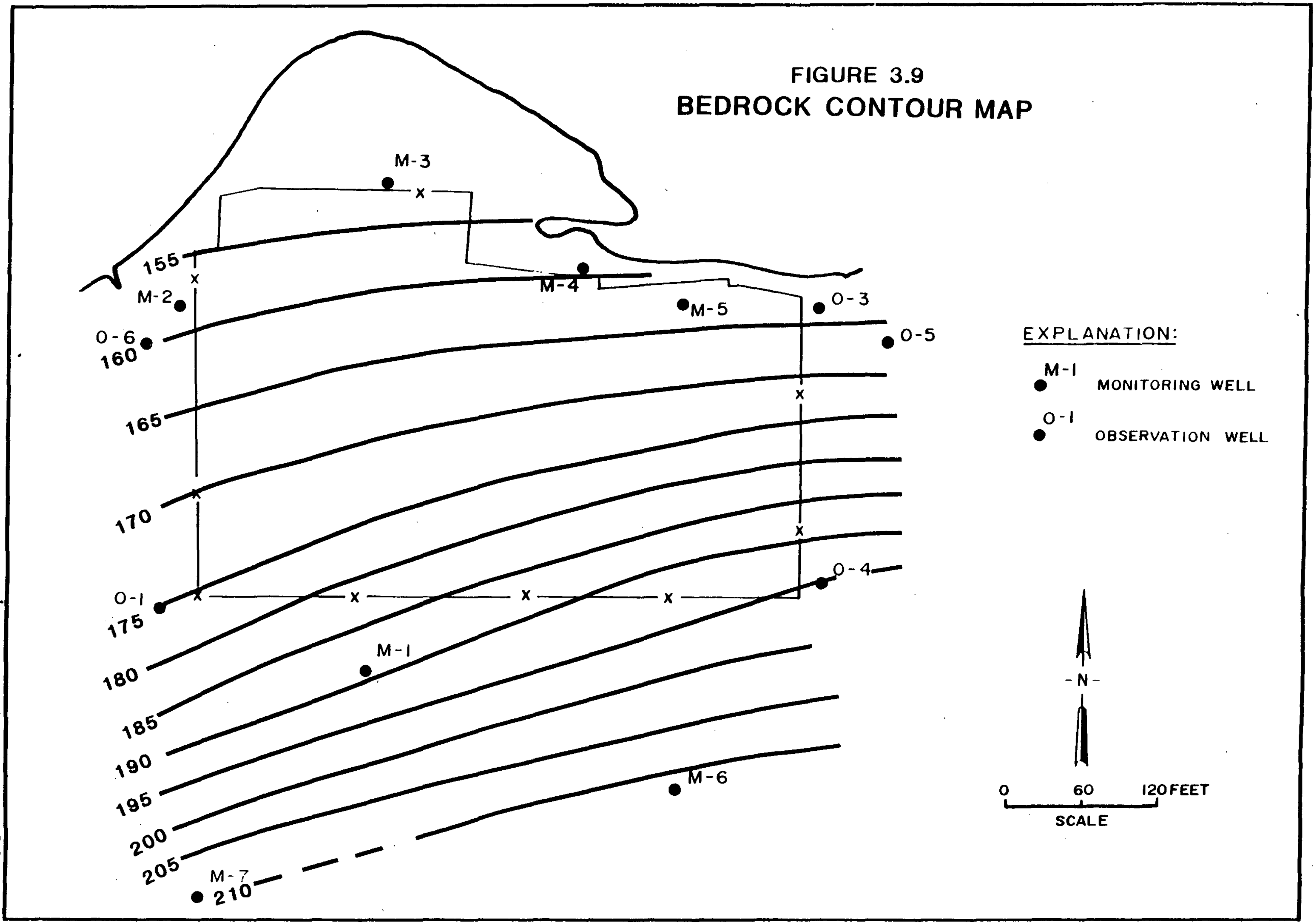


Table F1 (Appendix F) summarizes test boring information for both Phase 1 and Phase 2 investigations. The logs of all test borings are included in Appendix F.

CHAPTER 4

GROUNDWATER HYDROLOGY

Information describing groundwater conditions and resources of Union County has been obtained from Nemickas (1976). An overview of this report has been prepared to support this investigation and is given below. Additionally, the subsurface geology of the site environs was examined by Engineering-Science and a summary report prepared and submitted to NJDEP ("Preliminary Hydrogeologic Investigation, Task 1: Definition of Site Geology" ES, December, 1983). The following description also summarizes the contents of that report.

Groundwater typically occurs in alluvial deposits, stratified glacial materials, and the underlying bedrock. The glacial lake deposits are not considered to be an aquifer of consequence primarily due to the poor transmissive qualities ascribed to the clays and other fines present within them. Historically, it was common practice to construct large-diameter wells into the stratified glacial deposits which occur two or more miles northeast of the site. Usually, modest quantities of water could be obtained from the sand and gravel layers within the stratified glacial materials, however, they would run dry occasionally during periods of drought. Moderate quantities could be obtained from the alluvium, but its occurrence is limited to stream valleys. The most reliable source of groundwater was reported to be the fractured zones of the underlying Brunswick Formation. Numerous wells were drilled into the rock in Union County in the past. The rock aquifer typically occurs at depths of less than 100 feet and is soft and easily penetrated. At least two such wells (now sealed) were known to exist at the subject site and were used to provide process water. A third, still open but unused rock well is located at a private dwelling about 200 feet upgradient from the site at the intersection of Summit Avenue and Garfield Street. Presently, area residents derive water supplies from a municipal system (Commonwealth Water Company). The Commonwealth Water Company draws 30 to 40 percent of its water from the Passaic River, except during low flow periods. The CWC intake is approximately six miles downstream of the site.

Groundwater was reported to occur in the alluvium and stratified drift under water table (unconfined) conditions and under artesian (confined) conditions in the bedrock. Recharge of the unconsolidated deposits primarily occurs by precipitation falling on and infiltrating through exposed portions of the units. Recharge of the bedrock aquifer probably occurs by flow from overlying and adjacent units or directly where the rock is exposed to precipitation or surface water.

Groundwater conditions at the subject site have been investigated by use of physical observation, test borings, electrical resistivity, observation wells, monitoring wells, by direct measurement (down hole), and by water quality sampling. Observation and monitoring well construction details are included in Appendix C. A typical well installation drawing is shown as Figure 2.2.

The Phase I test boring program indicated that two water-bearing strata, or zones of interest, exist at the subject site. These correspond to the units previously identified in the discussion of site geology:

- fill and alluvium (shallow water-bearing zone), and
- residual soil/weathered rock (deep water-bearing zone).

SHALLOW WATER BEARING ZONE (FILL AND ALLUVIUM)

The fill and alluvium are considered to be a single water bearing unit for purposes of this assessment. The fill is a heterogeneous mixture of sand, silt, clay, gravel, cinders, metal, etc. ranging in thickness from zero (at M-6) to 14 feet (along the Passaic River). The alluvium consists of a 1.5 to 17 foot thick sequence of sand, silt and clay which occurs along the margins of the Passaic River. It was encountered in the central to western portions of the site. The fill and alluvium unit is apparently present beneath the entire site and extends a short distance south (uphill) of the site proper. It occurs at or near ground surface. Much of the unit is covered by asphalt pavement and concrete slabs at the site. Groundwater occurs in this zone at shallow depths (5 feet below ground surface or less) under water table conditions.

In this unit, the water table may be portrayed as a subdued replica of the topographic surface. Groundwater in the fill and alluvium flows from recharge areas (highlands) to the discharge areas (lowlands or surface waters). Topographically high areas form the hingelines or groundwater divides between areas of differentiated flow. (For a discussion of this, see Freeze and Cherry, 1979, pages 193-203). An area with unique flow patterns and hydrogeologic characteristics may be called a "groundwater basin." Groundwater flow does not cross basin boundaries, but rather enters the basin in the recharge zone and then flows directly, via the shortest possible route, to the nearest point of discharge. At the study area, local groundwater basin boundaries are likely formed by the northeast-southwest trending hillcrest located south of the facility and the Passaic River.

The path of flow of groundwater in the shallow aquifer occurs along the upper surface of the glacial lake deposits through the fill and alluvium. The glacial lake deposits are highly impermeable when compared to the fill and alluvium and hence act as a hydraulic barrier (or aquaclude) to downward water movement. The groundwater in the upper aquifer is thus forced by gravity to flow from higher to lower elevations along this hydraulic barrier. The Phase 2 investigation provided an additional 106 boring locations which penetrated the fill material to the top of the glacial lake deposits allowing determination of the elevation of the top of this formation at the boring locations. From this information one may construct an accurate topographic map of the top of the glacial lake deposits in the vicinity of the site. Figure 4.1 is the topographic representation of the top of the glacial lake deposits as constructed from all boring data collected to date.

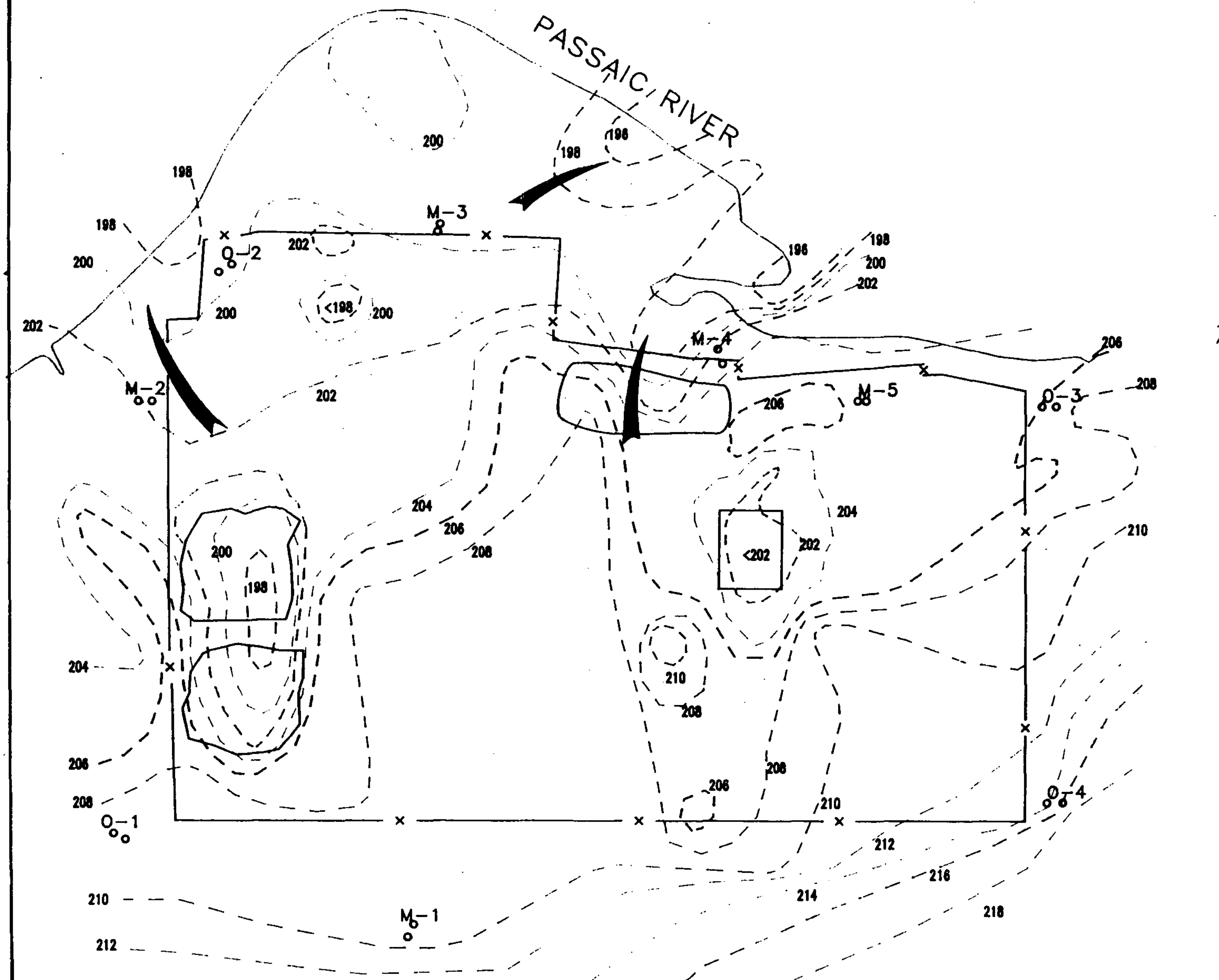
As may be seen from examination of Figure 4.1 there appear to be two major paths of groundwater migration beneath the site. The first follows a generally northward path through the east central portion of the site apparently discharging to the Passaic River in the vicinity of the former Clear Water Lagoon. The other major groundwater migration pathway apparently lies between M-2 and 0-2 on the western site boundary and trends north-northwest toward the Passaic River. Another feature apparent from examination of Figure 4.1 are the depressions in the glacial lake formation in the areas of the Chemical Sewer Lagoon, Chemical Lagoons and Dredged Material Disposal Area. These depressions were probably the result of excavation of the various lagoons and disposal pits. From the topography of the top of the glacial lake deposits it appears that the Clear Water Lagoon may have been created by damming a naturally-occurring low spot.

Comparison between Figure 4.1 and plots of groundwater contours for the past three years (Appendix G) at the site is inconclusive but at times the groundwater elevations seem to mirror the glacial lake topography shown in Figure 4.1. Water surface elevations measured in all wells for the period November 1983 to November 1986 are given in Appendix G.

The shallow zone probably receives very little precipitation recharge on-site, as most of the study area is paved (including Summit Avenue) and therefore directs most meteoric water away from the site before it has the chance to infiltrate. The greatest amount of recharge to the fill zone probably occurs south (uphill) and west of the site in the generally undeveloped areas adjacent to the site. The impact of recharge on shallow zone water levels may be observed on the hydrographs (Appendix G). Seasonal precipitation appears to have gradually increased site groundwater levels with each rainfall event. Water levels also indicate that recharge may be received from the deep aquifer.

FIGURE 4.1

SUBSURFACE CONTOURS
TOP OF GLACIAL LAKE DEPOSITS



LEGEND

STRUCTURE CONTOUR (APPROXIMATE ELEVATION OF GLACIAL LAKE DEPOSITS)

APPARENT PRINCIPAL GROUNDWATER FLOW PATH

NOTE: CONTOURS ARE INTERPOLATED BETWEEN BORING LOCATIONS (PHASE 2 AND OTHER HISTORIC DATA)

-N-

0 60 120

FEET

SCALE: 1" = 60'

9H/8:9H4.1

Twenty-four months of water levels were observed on a once per week schedule (9/28/83 to 9/26/85). Since 9/26/85, water level observations have been taken approximately once per month. The monitoring well water surface elevation readings are given in Appendix G. Also in Appendix G are the monitoring and observation well hydrographs and corresponding precipitation records for the period 1/5/84 to 9/26/85. During the period of record, water levels in the shallow wells showed a very rapid transient increase associated with precipitation events of greater than 2 inches. Water levels in all wells decreased during the winter of 1984-1985 and continued to decrease until the end of the summer of 1985 due to the extended drought experienced in the area during this period.

Underflow is defined by the U.S. Environmental Protection Agency (EPA) as the rate (or occurrence) of groundwater flow from adjoining areas directly into a disposal facility (Fenn et al., 1980). It is a major portion of any study area's hydrologic balance and must be considered when conducting a groundwater investigation. Lateral migration of contamination may occur as a result of underflow. Underflow-caused contamination can occur if one or both of the following conditions is met:

(1) The base of the disposal facility was constructed at or below the normal groundwater level or seasonal high-water level.

(2) The facility was constructed in a low area that adjoins a much higher zone in surface elevation. This may create a significant hydraulic gradient beneath the site.

As may be seen from examination of Figure 4.1 the areas associated with the Chemical Sewer Lagoon (CSL) and the North (NCL) and South (SCL) Chemical Lagoons appear to have been excavated into the top of the glacial lake deposits. These excavations appear to be between two and four feet into the upper portion of this formation. If the contours shown in Figure 4.1 represent the actual physical conditions of the lagoon areas, groundwater would tend to collect in these areas even during dry periods. Thus at least a portion of the lagoons would be almost constantly below the water surface elevation in the upper aquifer (Case 1). Because of this a potential for underflow exists both in the CSL and the north and south chemical lagoons.

Immediately underlying the shallow water-bearing zone is the glacial lake varved clay layer. The glacial lake materials extend beneath the entire study area and beyond as samples of the material were present at all boring and well locations both in Phase 1 and Phase 2. The stratum varies in thickness from 9 feet at M-6 to 39.75 feet at M-2 and acts as an aquiclude between the upper and lower water bearing units encountered at the site. The hydrologic properties of this unit were determined by obtaining undisturbed samples of the material during the

Phase 1 test boring program and subjecting these samples to soil mechanics laboratory analyses. The results of these analyses are presented in Table 4.1.

Organic fluids can cause deterioration of clay layers resulting in permeability increases of several orders of magnitude. However, many organics at or near their solubility limits in aqueous solution cause no appreciable increase in permeability (Evans et al., 1985). In addition, the clay layer (glacial lake deposits) is sufficiently thick to minimize any alteration of the permeability resulting from the overlying shallow aquifer which is contaminated with volatile organics. The vertical upward hydraulic gradient from the deep aquifer to the shallow aquifer resulting from artesian conditions impedes any downward migration of contaminants from the shallow to the deep aquifer directly beneath the site.

DEEP WATER BEARING ZONE (RESIDUAL SOIL)

Groundwater conditions in the residual soil (weathered rock) aquifer were investigated in a manner identical to the procedures used to examine fill zone characteristics. During the Phase 1 investigation four observation wells and five monitoring wells were installed into this aquifer to permit water level monitoring, flow direction determination, flow velocity measurements and water quality sampling. Two additional monitoring wells were installed into the residual soil upgradient of the site during the Phase 2 investigation.

The residual soil aquifer is a relatively thin stratum of clay, silty clay, and fine sandy silty clay with coarse sand and gravel (shale fragments) intermixed. It is apparently present just above competent bedrock. Groundwater occurs in this unit under artesian conditions during most periods of the year, as water levels in the downgradient Phase 1 wells sealed into the residuum rise to an elevation far above the point where water was encountered. For the most part, water surface elevations at most well locations are higher in the deeper aquifer than in the shallow aquifer. Exceptions occur in wells M-1, M-7, and 0-4 where deep water surface elevations higher than shallow elevations are the exception rather than the rule. "Reversed head" conditions have existed at wells M-1, M-7, and 0-4 during 88, 75, and 62 percent, respectively of the water level readings collected since 1983 (1985 for M-7). This condition probably exists because the two zones (fill and residual soil) are closer together upgradient of the site (glacial lake deposits are thinner) and both zones exist near the surface of the ground in these areas. In fact, as stated before, no fill zone is apparent at M-6 and the residual soil aquifer is only about 15 feet below the surface at this point. Downgradient wells M-3, M-4, M-5, and 0-1 have occasionally displayed piezometric surfaces in the upper aquifer higher than those in the lower aquifer but this condition seems to be related to the length of time between significant rainfalls. "Reversed head" conditions have existed at wells M-3,

TABLE 4.1

PROPERTIES OF GLACIAL LAKE MATERIALS

Boring number	O-2	O-2	O-2	O-4
Sample number	UD-1	UD-2	UD-3	UD-4
Depth interval of sample (feet below grade)	18-20	30-32	42-44	14-16
Vertical permeability (k in cm/sec)*	1.0×10^{-9}	2.7×10^{-10}	1.5×10^{-10}	4.0×10^{-10}
Dry density, lbs/ft^3	87.1	80.3	84.4	86.4
Natural moisture, %	36.4	42.1	38.4	37.0

* Measured in a consolidometer following the procedures given in the Engineering Manual, U.S. Army Corps of Engineers Manual EM 1110-2-1906, May 1980, Section VII-22

Source: John C. Mahle, Jr., P.E., Johnson Soils Engineering Company, 752 Grand Avenue, Ridgefield, New Jersey 07657, 201/943/1793

M-4, M-5, and O-1 during 1, 1, 9, and 12 percent, respectively, of the water level readings collected since 1983. Apparently, protracted dry periods cause the water surface in the lower aquifer to fall below that in the upper aquifer at these locations. The head difference between the two aquifers during these periods was limited to about one foot (+/-) at these two wells which would not cause transport of water from the upper to the lower zones, particularly given the thickness of the glacial lake deposits at these locations and the short duration of this "reversed head" condition. The remaining three wells (M-2, O-2, and O-3) have not exhibited the head reversal of the wells mentioned above.

The response of the deep water-bearing unit may be seen on the hydrographs included in Appendix G. While shallow unit reaction to precipitation is a gradual increase in site water levels, deep unit response is a delayed (four to seven days), but marked rise in groundwater elevations. This phenomena suggests that:

1. The deep water-bearing unit is tightly confined in the immediate study area; and

2. The deep water-bearing unit is recharged at a point not far from the site. A likely candidate area would be the hill south of the site, traversed by Garfield Street. This assumption is borne out by the information collected during the installation of well M-6 which shows the residual soil aquifer to be just below the ground surface and rising toward the southeast. This area was mapped as a "bedrock exposure" (Darton et al., 1908) and is partially reproduced in this report as Figure 3.2.

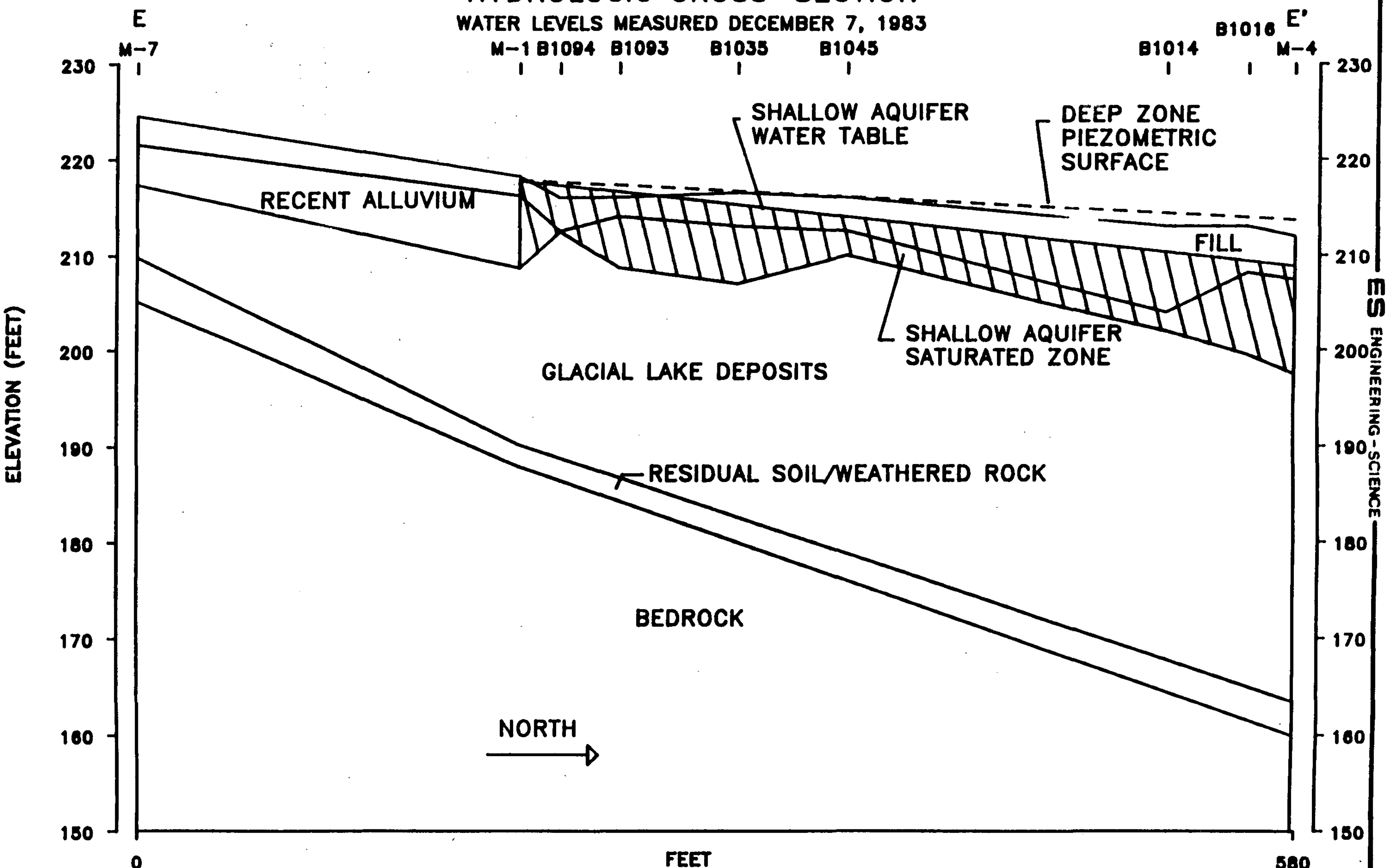
Deep zone potentiometric surface contour maps have been prepared and are presented in Appendix G. These potentiometric surfaces of the deep zone suggest that flow is diverted generally north from the site in a pattern roughly conforming to the surface of the bedrock valley postulated by Nemickas (1974). The potentiometric surface contour maps for the deep aquifer also indicate short periods, particularly during the fall months.

Figure 4.2 is a hydrogeologic section drawn through the study area. This figure depicts the units encountered during the investigation and the groundwater levels within them. Based upon the December 7, 1983 water levels, a strong upward flow component may be noted, proceeding from the deep aquifer toward the shallow zone. Flow in the shallow units appears to be directed north, along the section toward the Passaic River and/or the north site boundary. From examination of the groundwater contour maps shown in Appendix G it may be seen that this situation remains relatively constant with time. During the period January 1, 1984 to September 30, 1985, water level readings indicate that flow in the upper (fill) zone trends toward the north or northwest in general following the depressions in the top of the glacial lake deposits indicated in Figure 4.1. Flow in the lower (residual soil) zone appears to trend north or northeast under the site

FIGURE 4.2

HYDROLOGIC CROSS-SECTION

WATER LEVELS MEASURED DECEMBER 7, 1983



and, due to the head difference between the upper and lower aquifers water would have a tendency to move upward, from the lower to the upper aquifer if subsurface conditions allowed.

Groundwater flow directions and velocities in the deep observation wells were measured using a Flow Meter on October 3-5, 1983, and are summarized below. The instrument was calibrated specifically for the type of well in which it was employed. The test data are considered to be representative for the hydrologic and climatic conditions existing on the test date.

Observation Well Number	Principal Flow Direction	Average Flow Velocity (ft/day)
01-D	Northwest	7.23
02-D	Northwest	14.07
03-D	Northwest	10.31
04-D	Northwest	15.27

In general, the measured flow rates are consistent and appear to be within the range of values expected for aquifers composed of similar materials.

GROUNDWATER FLOW RATES

On November 13 and 14, 1985 falling head slug tests were performed on 15 wells and piezometers at the site to determine in-situ hydraulic conductivity of the shallow aquifer. The tests consisted of (1) determination of static water level, (2) addition of demineralized water to a depth above the screened interval, and (3) monitoring of the water level recovery vs. time. Water level measurements were taken at regular intervals after the addition of water until a near-static level was achieved. Slug test data acquired in the field were reduced in accordance with procedures developed by Bouwer and Rice (1976). All test data and analyses are included in Appendix O.

Hydraulic conductivities for the wells tested at the site ranged from 10^{-2} to 10^{-5} cm/sec (10^{-4} to 10^{-6} ft/sec). Table 4.2 contains the results of the slug tests (hydraulic conductivities). The wells located at the downgradient face of the site (M-2S, P-3, M-3S, P2, M-4S, M-5S, P1 and O-3S) displayed hydraulic conductivities ranging from $5.75X10^{-5}$ cm/sec (M-5S) to $3.45X10^{-2}$ cm/sec (P2).

TABLE 4.2

SLUG TEST RESULTS

Wells	K(ft/sec)	K(cm/sec)
M1-S	1.61×10^{-5}	4.91×10^{-4}
M2-S	4.92×10^{-6}	1.50×10^{-4}
M3-S	3.09×10^{-5}	9.42×10^{-4}
M4-S	7.72×10^{-6}	2.35×10^{-4}
M5-S	1.89×10^{-6}	5.75×10^{-5}
M7-D	2.65×10^{-5}	8.07×10^{-4}
O1-S	2.70×10^{-5}	8.22×10^{-4}
O2-S	6.18×10^{-5}	1.88×10^{-3}
O3-S	9.67×10^{-6}	2.95×10^{-4}
O4-S	4.50×10^{-6}	1.37×10^{-4}
O5-S	3.82×10^{-4}	1.16×10^{-2}
O6-S	5.00×10^{-6}	1.52×10^{-4}
P-1	7.47×10^{-6}	2.28×10^{-4}
P-2	1.13×10^{-4}	3.45×10^{-3}
P-3	2.42×10^{-5}	7.37×10^{-4}

Knowing both the average hydraulic conductivity for the shallow aquifer and water surface elevations at all wells, one may use Darcy's Law to calculate an average groundwater flow velocity through the downgradient face of the shallow aquifer to the Passaic River. Darcy's Law may be expressed as follows:

$$V = -K\,dh/dl$$

where V = groundwater flow velocity (m/day)

$-K$ = measured hydraulic conductivity of aquifer segment in question (m/day)

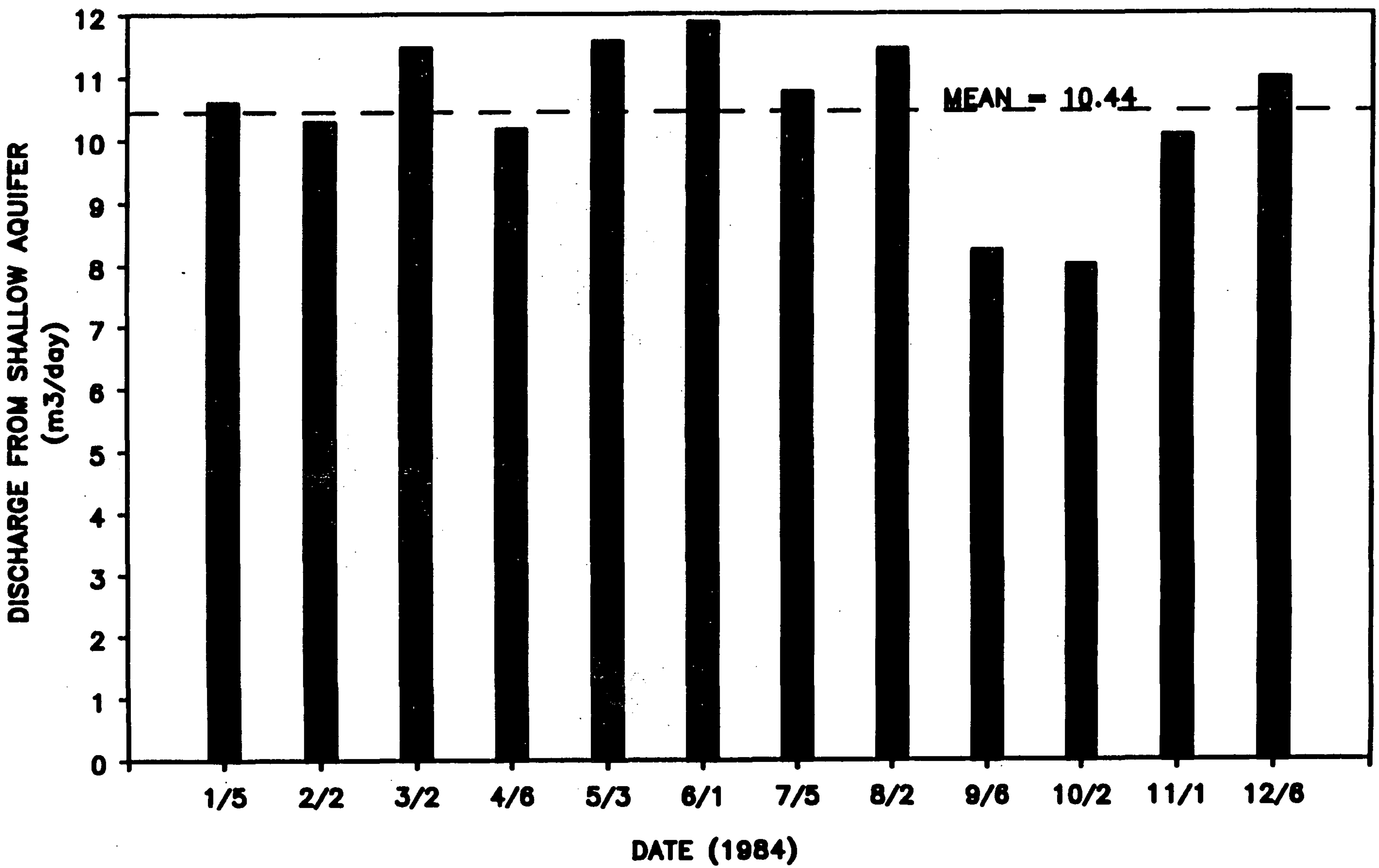
dh/dl = hydraulic gradient between points of interest in the aquifer (m/m)

The velocity expressed by the above equation multiplied by the cross-sectional area (m^2) of the aquifer saturated zone yields the discharge (m^3/day) for the section of the aquifer in question.

Darcy's Law was used to calculate the discharge volume from the shallow aquifer on the first day of each month when water level readings were obtained during calendar year 1984. Figure 4.3 is a chart of these monthly values of groundwater discharge. Figure 4.4 is a plan and profile view of the downgradient face of the shallow aquifer. (Appendix P contains the calculation sheets used to determine the discharges shown in Figure 4.3). Also shown in Figure 4.4 are values for the hydraulic conductivity and cross-sectional area of each segment of the downgradient face of the aquifer.

From examination of Figures 4.3 and 4.4 it may be seen that the mean value of discharge from the shallow aquifer is 10.66 m^3/day (2814 gal/day). In the previously submitted "Remedial Action Plan" (Engineering-Science, Inc. November, 1984) discharge from the shallow aquifer was calculated to be approximately 90,000 gal/day. The assumed value for the hydraulic conductivity of the shallow aquifer used in the previous analysis was 21.3 m/day (70 ft/day). The actual measured value of hydraulic conductivity of the downgradient face of the aquifer (0.658 m/day) is only about 3.1 percent of the estimated value. When the estimated discharge (90,000 gpd) is multiplied by the 3.1 percent ratio of the actual to the estimated hydraulic conductivities, a value of 2780 gal/ day results. This compares favorably with the calculated average discharge of 2814 gal/day using Darcy's Law.

FIGURE 4.3
DISCHARGE FROM SHALLOW AQUIFER ON SELECTED DATES



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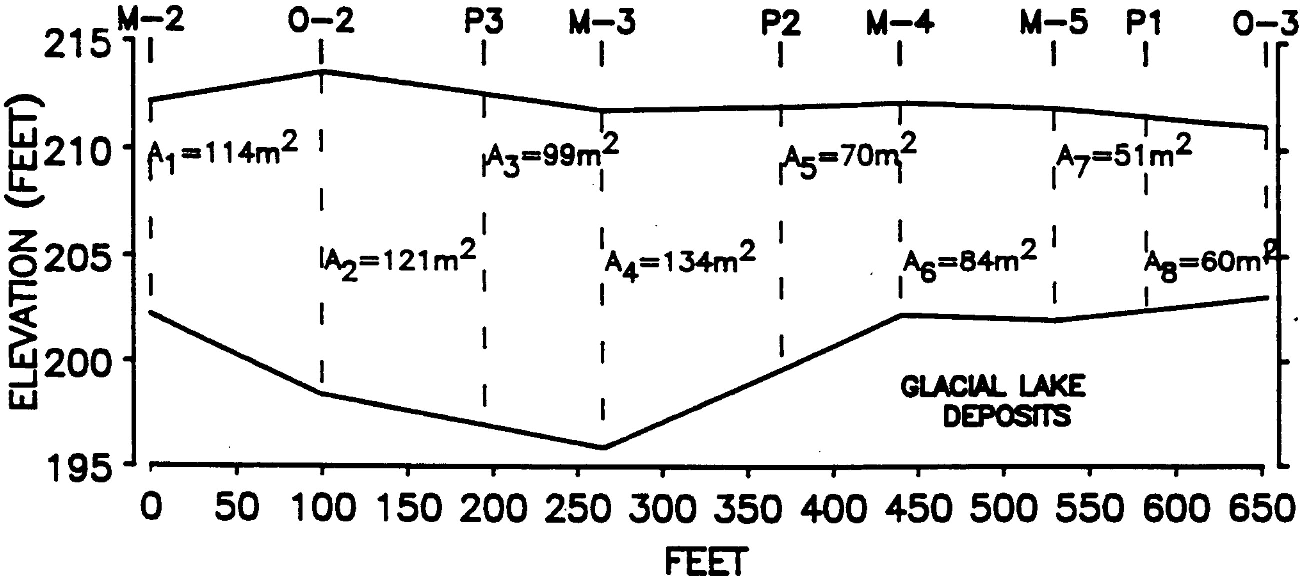
BH/B:BH4.3

FIGURE 4.4

PLAN AND PROFILE OF DOWNGRADIENT FACE OF SHALLOW AQUIFER



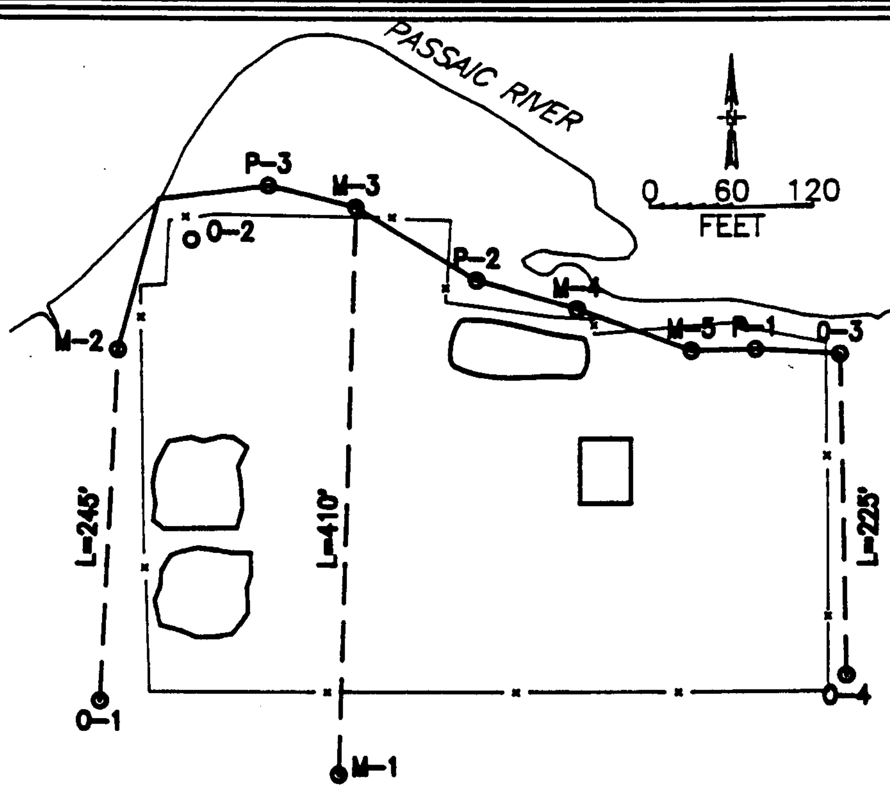
SEGMENT NUMBER	L (FEET)	K (10^{-3} m/sec)*	dh/dl
1	95.5	0.877	(1)
2	95.5	0.131	(1)
3	70	0.725	(2)
4	105	1.874	(2)
5	70	1.567	(2)
6	90	0.124	(2)
7	53	0.124	(3)
8	70	0.250	(3)

(1) $\left(\frac{(\text{EL O-1S})-(\text{EL M-2S})}{245} + \frac{(\text{EL M-1S})-(\text{EL M-3S})}{410}\right) \times 0.5$

(2) $\frac{(\text{EL M-1S})-(\text{EL M-3S})}{410}$

(3) $\frac{(\text{EL O-4S})-(\text{EL O-3S})}{225}$

* AVERAGE OF K VALUES OF WELLS AT ENDS OF SEGMENTS



Based upon the above analysis and comparisons, a reasonable estimate of the average groundwater flow rate through the site is 2800 gallons per day. Although most or all of this flow may be intercepted by the Passaic River, it is possible that a portion of the flow is diverted along the bedding around the sanitary sewer line. At the present time limited groundwater level data indicate that the gradient along the sewer line generally slopes from east to west (from 0-5 toward the site) indicating that transport of contaminants along the sewer from the plant toward 0-5 may only be intermittent.

CHAPTER 5

AREAS OF SITE CONTAMINATION

During the course of Phase 1 and Phase 2 of the remedial investigation the areas of contamination at the Berkeley Heights site were delineated. These areas of contamination fall into two categories: sources of contamination and other areas (which were contaminated due to the sources). Each of the areas is discussed in detail below. An overall assessment of site contamination is discussed in the executive summary.

During both Phase 1 and Phase 2 investigations a number of samples were collected and analyzed for the 126 priority pollutants plus the next 40 highest peaks by a gas chromatograph/mass spectrometer scan. These 40 highest peaks were then tentatively identified by the analytical laboratory using their computer library. The data from both Phase 1 and Phase 2 40 highest peaks scans may be found in Appendix Q. All other Phase 1 and Phase 2 data may be found in Chapters 5 and 6.

Approximately 25% of the samples collected during Phase 2 were analyzed in the above manner. The remaining samples were analyzed for a group of indicator parameters which are representative of the compounds on the site. The indicator compounds were selected through consultation and agreement with NJDEP (see Appendix U) based on the results of the Phase 1 site investigation and an evaluation of raw materials and products used or manufactured at the plant. The indicator parameters which were used in the Phase 2 site investigation of soils are:

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- bis(2-ethylhexyl)phthalate
- Chrysene
- 1,2-Dichlorobenzene
- Fluoranthene
- Phenanthrene
- Pyrene
- Polychlorinated Biphenyls
- Ethylbenzene
- Chlorobenzene
- Benzene
- Toluene
- Total phenols

SOURCES OF CONTAMINATION

The following section describes the contamination sources on the plant site as determined by Phase 1 and Phase 2 sample results. Throughout this report the terms high, moderate and low are used to describe contaminant concentrations. HIGH means a concentration greater than 100 parts-per-million (mg/kg for soil, mg/l for water); MODERATE means a concentration between 10 and 100 parts-per-million; LOW means a concentration of less than 10 parts-per-million. (These terms, as used in this report, are for descriptive purposes only and do not attempt to describe proposed levels of cleanup. They are used for brevity in describing contamination levels and to provide a common basis of comparison between areas.)

Heat Exchanger

An oil filled heat exchanger system was reported to have been located in Building No. 5 in the southeastern portion of the site (Figure 5.1). The oil used in the exchanger system contained polychlorinated biphenyls (PCBs). An explosion in 1967 in a separate building ruptured the system piping resulting in the release of PCBs to the surrounding area. The volume of oil lost is not known precisely, but is estimated to be 300 to 600 gallons (including 3500-7000 pounds of PCBs). Evidence of the contamination was found by visual inspection after the plant had been demolished in July, 1982 (Roy F. Weston, Inc., 1982). The PCB contamination is primarily confined to surface soils on the plant site. (A more detailed discussion of this surface soil PCB contamination is included in the section below titled CONTAMINATION IN OTHER AREAS). While high concentrations of PCBs exist on site primarily in and around this source PCBs have been spread to other locations by movement of surface soils during plant demolition and by erosion. (In November 1983 one set of groundwater samples from all existing wells was analyzed for 2, 3, 7, 8 Tetrachlorodibenzofurans (TCDF). Appendix S contains copies of the analytical results from these samples. An analytical detection limit of less than one part-per-trillion (ppt) was used in all cases. No TCDF was detected in any of the samples analyzed.)

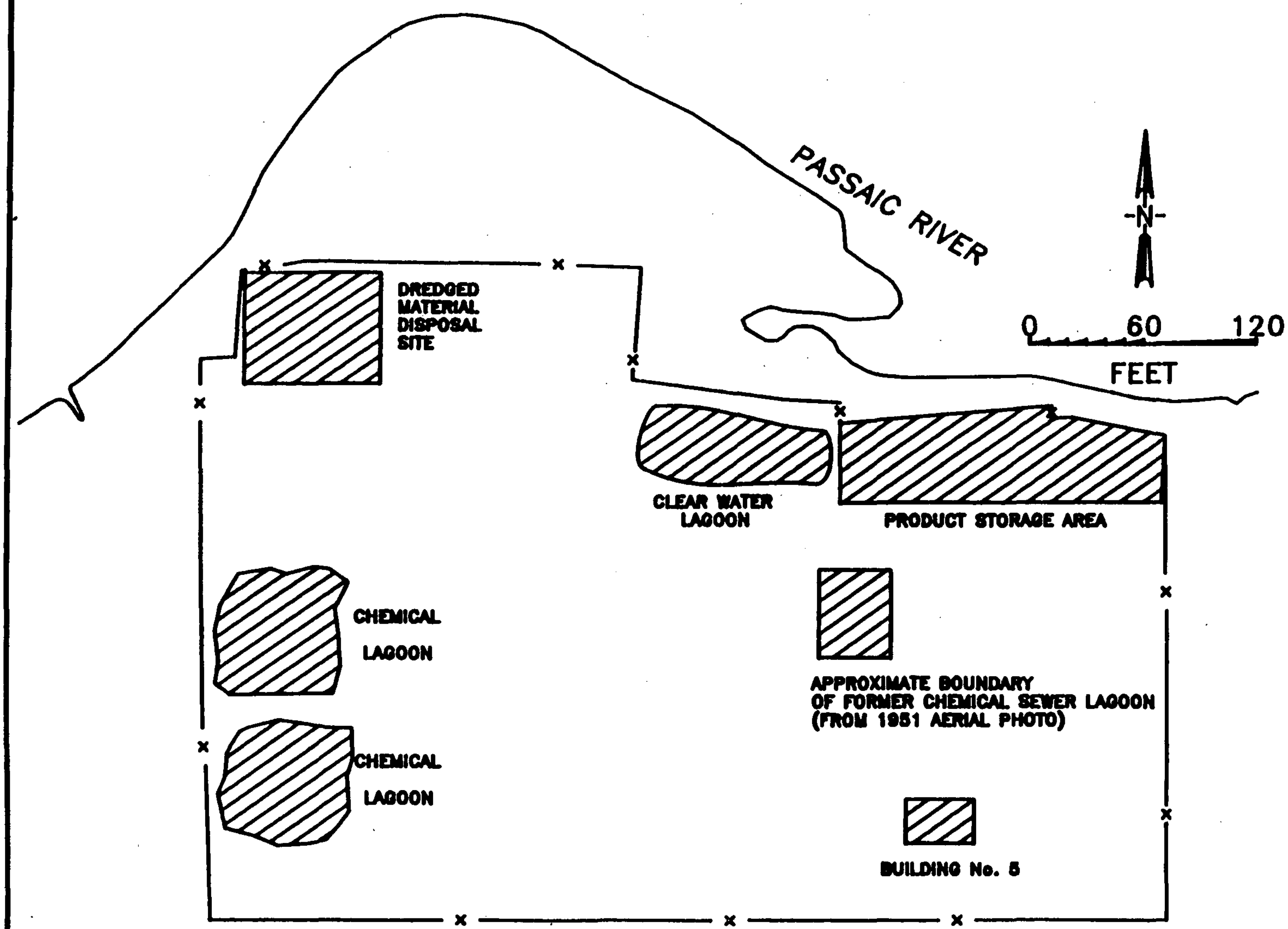
Clear Water Lagoon

The Clear Water Lagoon (CWL) was located in the north central portion of the site. The lagoon stored non-contact cooling water that had been used in the plant, and storm drainage. From the CWL, water was chlorinated and discharged to the Passaic River, or could be pumped back to the plant for re-use as cooling water. When the plant was demolished this lagoon was drained and backfilled with material from the plant site.

Roy F. Weston, Inc. investigated the Clear Water Lagoon during Phase 1. They performed nine soil borings in the area which was assumed to be occupied by the CWL (as determined from

FIGURE 5.1

CONTAMINATION SOURCES



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aerial photographs). Samples from various depths were collected from each of these borings and analyzed for PCBs. A composite sample from six of Weston's soil borings was also analyzed by gas chromatography/mass spectrometry (GC/MS) for organic compounds. The results of these analyses are discussed below. Weston's Phase 1 boring locations in the CWL area are shown in Figure 5.2. A schematic of Weston's borings in cross-section is shown in Figure 5.3.

Engineering-Science, Inc. (ES) conducted a supplemental investigation of the CWL during Phase 2. ES performed ten borings in the area of the CWL. The locations of these Phase 2 borings are shown in Figure 5.4. Each of the Phase 2 borings was sampled at several depths corresponding to those approved in the Phase 2 Supplemental Sampling Plan (ES, April, 1985). Analyses for PCBs and other organic chemicals were performed on each of these samples. The results are discussed below.

Phase 1 analytical data for PCBs in the CWL may be found in Table 5.1. Boring K samples were not analyzed for PCBs because K was added during field operations only for the purpose of checking fill depth. These data indicate moderate levels of PCB contamination in the southern and eastern parts of the lagoon, with high levels in the western part of the lagoon. The northern areas of the lagoon and areas outside the north fence adjacent to the lagoon had no detectable levels of PCBs. The single Phase 1 composite sample analyzed by GC/MS showed high levels of 2,4,6-trichlorophenol and $C_{12}H_8SO_2Cl_3$, an unidentified compound. During the Weston borings, a catechol odor was detected. This was identified by Millmaster personnel present during drilling as tertiary butyl catechol (TBC), a phenolic compound that was a main product of the plant. However, TBC was not identified during the GC/MS scan.

Analytical results of samples collected from the CWL by ES during Phase 2 may be found in Table 5.2. These results indicate moderate to high levels of PCBs and volatile organics and moderate levels of polynuclear aromatics, phthalates and chlorinated benzenes (base/neutrals) throughout the lagoon area.

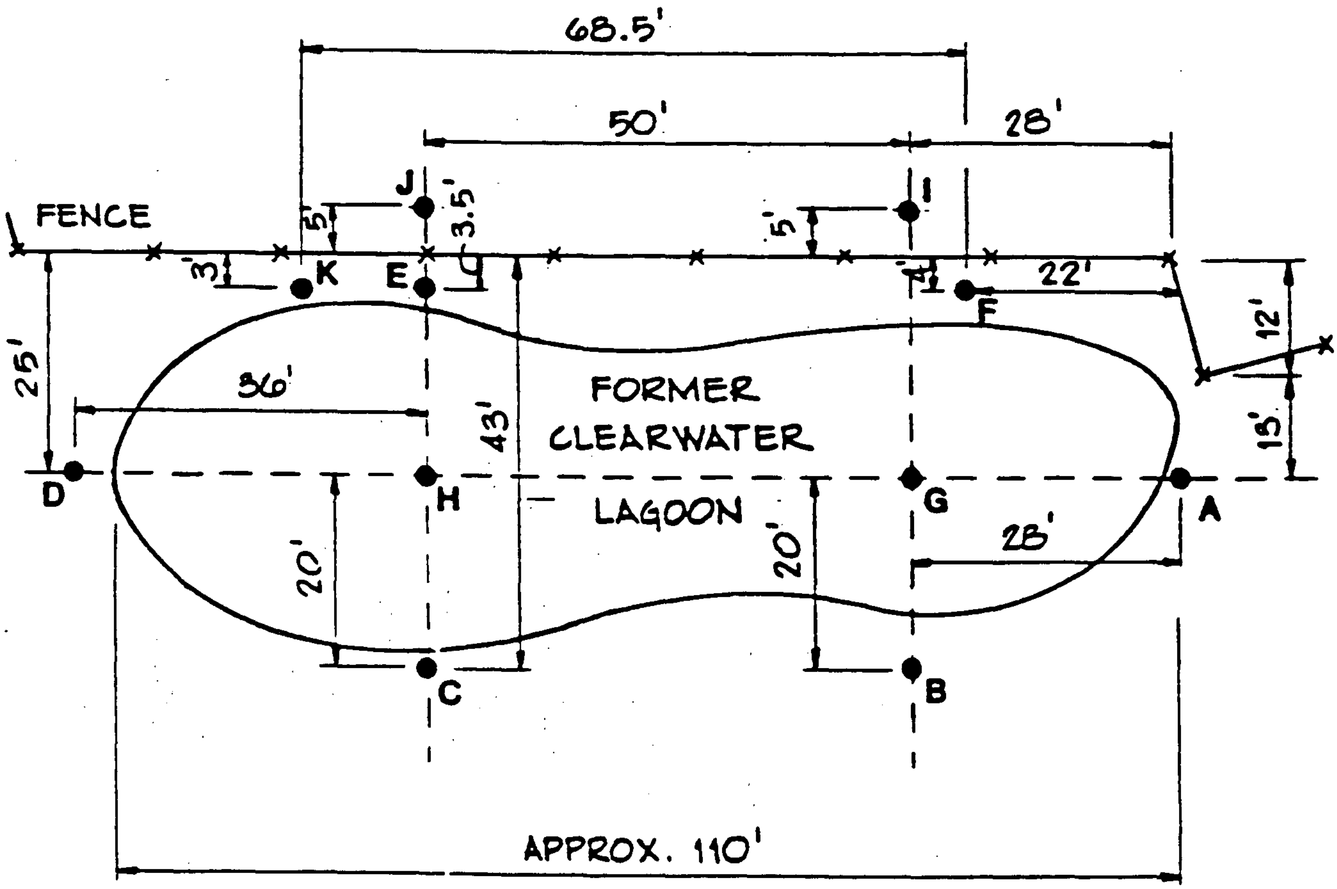
Three Phase 2 borings in the CWL were sampled for priority pollutant metals. All three borings exhibited at least one metallic compound whose concentration was outside the "typical" background range for soils as found in literature (see Appendix R). Boring B1017 exhibited concentrations of beryllium, copper, mercury, nickel, silver, and zinc which are outside of "typical" ranges for soils. Borings B1011 and B1013 exhibited elevated levels of mercury.

Phase 1 and Phase 2 sampling results have shown that high levels of pollutants exist in the CWL. The compounds which are readily miscible in water have moved from the CWL off the site toward the Passaic River. (See Chapter 6 for the basis for this conclusion). The CWL may therefore be categorized as a major source of contamination on the site.

FIGURE 5.2

APPROXIMATE BORING LOCATIONS IN CLEARWATER LAGOON AREA

(REF. WESTON, INC.)



● BORING LOCATIONS

NOTE: LAGOON CONTOURS APPROXIMATED FROM 1976 AERIAL PHOTO.

SKETCH NOT TO SCALE

FIGURE 5.3

BORING CROSS-SECTIONS CLEARWATER LAGOON AREA

(REF. WESTON, INC.)

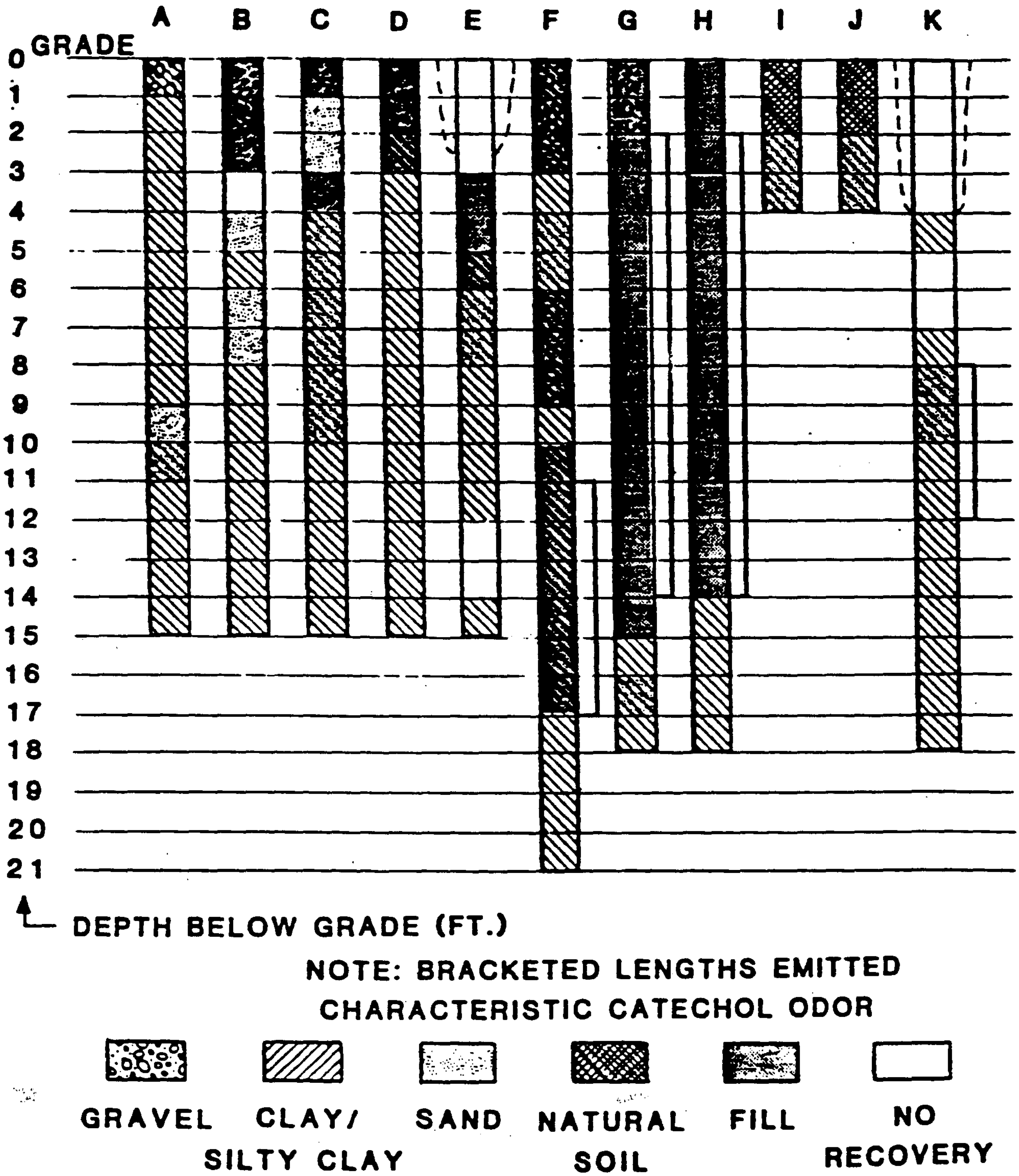


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FIGURE 5.4

PHASE 2 SITE INVESTIGATION SAMPLE LOCATION: CLEAR WATER LAGOON

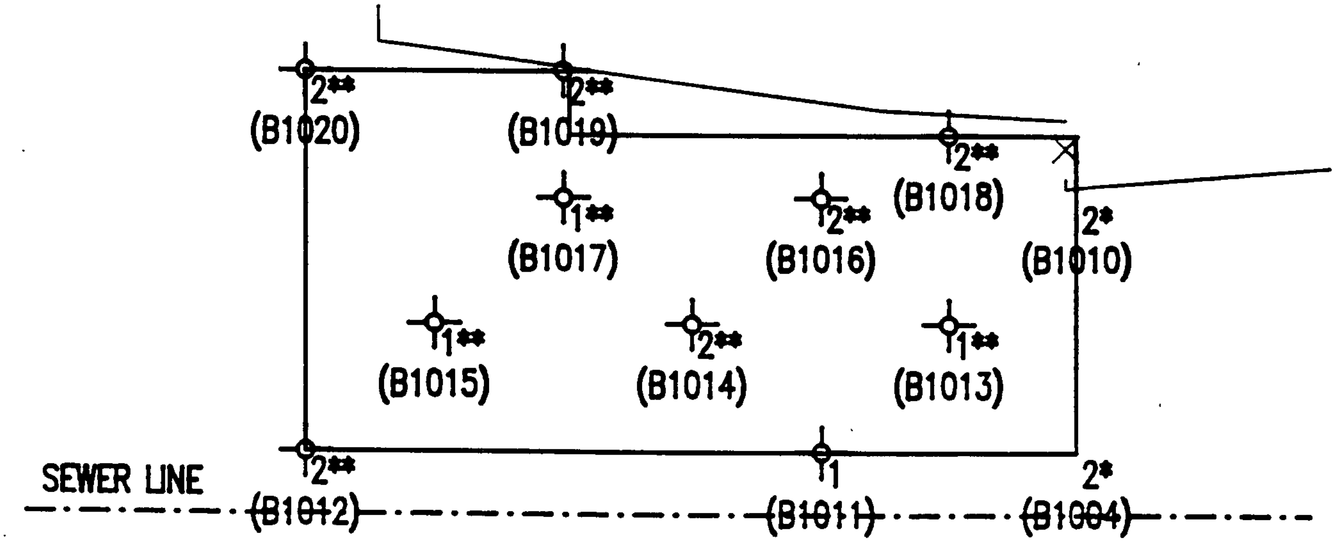
-N-

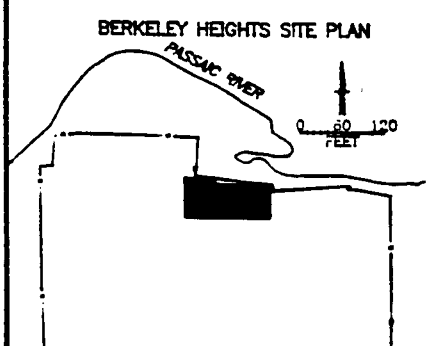
0 10 20 30 40 50

FEET

SCALE: 1" = 30'

BORING NO.	DATE COMPLETED
B1011	9/9/85
B1012	9/25/85
B1013	9/13/85
B1014	9/23/85
B1015	9/25/85
B1016	9/26/85
B1017	9/26/85
B1018	9/26/85
B1019	9/26/85
B1020	9/25/85





BORING LOCATIONS

1 SAMPLES ANALYZED FOR PRIORITY POLLUTANTS PLUS 40 PEAKS

2 SAMPLES ANALYZED FOR INDICATOR PARAMETERS

** CONTINOUS SAMPLING (ASTM D1586)

NOTE: THE SAMPLING LOCATIONS SHOWN ON THIS FIGURE ARE APPROXIMATE AND MAY HAVE CHANGED SLIGHTLY DUE TO FIELD CONDITIONS

* SAMPLE LOCATIONS ON PSA GRID – SEE FIGURE 5.10

TABLE 5.1
SOIL ANALYSIS RESULTS
CLEARWATER LAGOON AREA
ROY F. WESTON
(11-14 JANUARY, 1983)
(FOR LOCATION OF THESE BORINGS SEE FIGURE 5.2)

Field Sample Number*	PCB (mg/kg Dry Weight)
A-3	ND
A-6	ND
A-10	ND
B-2	80
B-6	ND
B-10	ND
C-2	ND
C-6	15.5
C-10	ND
D-2	18
D-6	ND
D-18	ND
E-4	ND
E-6	ND
E-10	ND
F-2	ND
F-10	ND
F-15	ND
G-2	10
G-6	24
G-12	98
G-14	ND
G-16	ND
H-2	22
H-8	1,100
H-10	6,000
H-12	1,040
H-14	ND
I-2	ND
I-4	ND
J-2	ND
J-4	ND

Notes: ND is not detectable (less than 5 mg/kg).
PCB is Arochlor 1248
* Example, A-3 represents sample taken from A borehole at 2-3 ft. depth; B-6 represents sample taken from B borehole at 5-6 ft. depth.

TABLE 5.2

RESULTS OF PHASE 2 CLEAR WATER LAGOON SAMPLING (ALL RESULTS IN MG/KG)

Boring Number	Depth	Ethyl-benzene	Chloro-benzene	Benzene	Toluene	Methylene chloride	Xylene	Methyl isobutyl ketone	Acetone	Methyl ethyl ketone	Arsenic	Berylium	Chromium	Copper	Lead
B 1011	0.5-1.5'	-	-	-	-	-	-	-	-	-	2.3	0.63	15.	51	250
	5.5-6.5'	-	-	-	-	-	-	-	-	-	1.3	0.60	14.	21	18
B 1012	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6-8'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1013	0-2'	-	-	-	-	-	-	-	-	-	1.8	0.6	16.	46	116
	5-7'	1.0	.06	.06	.05	-	6.7	-	-	-	2.2	0.7	22.	74	101
	9-12'	6.5	-	.16	.47	-	44.	-	-	-	-	-	-	-	-
B 1014	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	1.1	.12	-	.04	-	9.6	-	-	-	-	-	-	-	-
	6-8'	.15	.04	-	-	-	1.5	-	-	-	-	-	-	-	-
	8-10'	80.	-	-	-	-	870.	-	-	-	-	-	-	-	-
	10-12'	1.2	-	.05	.06	.14	14.	1.1	3.4	.23	-	-	-	-	-
B 1015	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6-8'	-	-	-	-	-	-	-	.68	-	-	-	-	-	-
B 1016	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8-10'	.74	.05	.04	.04	-	-	-	-	-	-	-	-	-	-
B 1017	0-2'	-	-	-	-	-	-	-	-	-	5.5	0.4	110.	29.	155.
	4-6'	100.	-	-	-	-	1110.	-	-	-	0.9	9.4	59.	510.	186.
	13-15'	6.1	1.1	-	.42	-	55.	-	-	-	4.0	1.1	31.	29.	40.
B 1018	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	6.7	2.9	-	-	-	-	-	-	-	-	-	-	-	-
	8-10'	37.	3.3	-	2.9	-	-	-	-	-	-	-	-	-	-
	14-16'	6.3	-	-	.36	-	-	-	-	-	-	-	-	-	-
B 1019	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	14.	6.0	-	-	-	-	-	-	-	-	-	-	-	-
	8-10'	61.	4.4	-	3.4	-	-	-	-	-	-	-	-	-	-
B 1020	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8-10'	4.4	-	-	1.5	-	-	-	-	-	-	-	-	-	-

TABLE 5.2, CONTINUED

Boring Number	Depth	Mercury	Nickel	Selenium	Thallium	Zinc	Cyanide, Total	Phenolics, Total	Silver	PCB	Phen-anthrene	Fluoranthene	Pyrene	Benzo(a)-anthracene	Acenaph-thylene
B 1011	0.5-1.5'	11.	16.	-	-	170.	-	0.7	-	7.2	6.5	7.6	7.1	11.0	-
	5.5-6.5'	-	14.	-	-	50	-	0.6	-	-	-	-	-	-	-
B 1012	0-2'	-	-	-	-	-	-	0.6	-	5.0	-	2.5	10.0	2.5	-
	6-8'	-	-	-	-	-	-	5.9	-	.06	-	-	-	-	-
B 1013	0-2'	1.5	15.	-	0.08	240.	-	-	-	10.0	1.8	2.3	1.3	1.3	.50
	5-7'	3.1	19.	0.1	0.06	196.	-	0.6	-	11.0	6.4	7.2	4.2	2.5	-
	9-12'	-	-	-	-	-	-	-	-	2.2	.20	-	-	-	-
B 1014	0-2'	-	-	-	-	-	-	-	-	1.1	2.8	6.6	5.1	3.0	1.4
	4-6'	-	-	-	-	-	-	-	-	57.0	.50	.60	.50	.30	-
	6-8'	-	-	-	-	-	-	-	-	15.0	.60	.80	.70	.40	.20
	8-10'	-	-	-	-	-	-	-	-	.25	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	.21	-	-	-	-	-
B 1015	0-2'	-	-	-	-	-	-	-	-	3.3	.40	.50	.40	.20	
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6-8'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1016	0-2'	-	-	-	-	-	-	-	-	*	-	-	-	-	-
	4-6'	-	-	-	-	-	-	0.9	-	48.0	5.0	5.0	2.5	-	-
	8-10'	-	-	-	-	-	-	0.4	-	23.0	12.5	10.0	7.5	5.0	-
B 1017	0-2'	1.3	9.	0.11	-	175.	-	0.3	-	6.6	1.6	2.6	1.7	1.1	.20
	4-6'	7.9	64.	0.12	0.05	876.	-	0.4	3.0	30.0	5.0	6.0	4.0	3.0	-
	13-15'	0.2	35.	-	0.12	198.	-	0.5	-	11.3	.10	.10	-	-	-
B 1018	0-2'	-	-	-	-	-	-	0.8	-	2.4	.60	.80	.60	.40	-
	4-6'	-	-	-	-	-	-	0.9	-	110.0	.70	1.1	.70	.50	-
	8-10'	-	-	-	-	-	-	10.4	-	3.4	.40	.90	.50	.40	-
	14-16'	-	-	-	-	-	-	4.9	-	.16	-	-	-	-	-
B 1019	0-2'	-	-	-	-	-	-	-	-	42.0	.50	1.0	.50	-	-
	4-6'	-	-	-	-	-	-	0.8	-	1300.0	1.0	1.0	-	1.0	-
	8-10'	-	-	-	-	-	-	0.9	-	1500.0	2.0	1.0	-	-	-
B 1020	0-2'	-	-	-	-	-	-	0.3	-	9.5	2.2	5.4	3.4	2.0	-
	4-6'	-	-	-	-	-	-	0.3	-	.06	.20	.40	.30	.20	-
	8-10'	-	-	-	-	-	-	-	-	1.7	1.5	1.9	1.3	.80	-

TABLE 5.2, CONTINUED

Boring Number	Depth	Anthracene	Acenaphthene	Fluorene	Naphthalene	Chrysene	Benzo(a)-pyrene	Indeno-(1,2,3-c,d)-pyrene	Benzo(ghi)-perylene	Dibenzo(a,h)-anthracene	Benzo(b) fluoranthene, Benzo(k)-fluoranthene	1,2-Dichloro-benzene	Diethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate
B 1011	0.5-1.5'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1012	0-2'	-	-	-	-	-	5.0	-	-	-	-	-	-	-	-
	6-8'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1013	0-2'	.70	-	-	-	1.2	1.8	2.8	2.7	-	2.0	-	6.5	-	-
	5-7'	2.2	1.4	1.2	-	2.9	2.5	-	-	-	4.0	-	-	-	-
	9-12'	-	-	-	.60	-	-	-	-	-	-	.10	-	1.1	-
B 1014	0-2'	1.5	.10	.40	.20	2.8	2.4	1.8	1.9	.40	3.7	-	-	.30	.30
	4-6'	.20	-	.10	.10	.30	.20	-	-	-	.30	-	-	.20	-
	6-8'	.30	.10	.20	.80	.40	.30	-	-	-	.40	-	-	.20	-
	8-10'	-	-	-	-	-	-	-	-	-	-	-	-	.20	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1015	0-2'	-	-	-	-	.20	.20	-	-	-	1.3	.10	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6-8'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1016	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8-10'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1017	0-2'	.60	-	.10	-	1.0	.90	.70	-	-	1.7	-	1.6	.20	1.4
	4-6'	-	-	-	-	3.0	3.0	-	-	-	5.0	-	-	-	-
	13-15'	-	-	-	-	-	-	-	-	-	-	-	-	.10	-
B 1018	0-2'	-	-	-	-	.40	.30	-	-	-	.50	-	-	-	-
	4-6'	-	-	-	-	.40	.40	-	-	-	.70	1.0	-	-	-
	8-10'	-	-	-	-	.40	.60	.60	-	-	.90	-	-	-	-
	14-16'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1019	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-
	8-10'	-	-	-	-	-	-	-	-	-	-	2.0	-	-	-
B 1020	0-2'	-	-	-	-	2.2	2.6	-	-	-	4.2	-	-	-	-
	4-6'	-	-	-	.20	.20	-	-	-	0.4	-	-	-	-	-
	8-10'	-	-	-	-	.90	.90	-	-	-	1.5	-	-	-	-

TABLE 5.2, CONTINUED

Boring Number	Depth	bis(2-Ethyhexyl)-phthalate	Dimethyl phthalate	1,2,4-Tri-chlorobenzene	2,4-Dichloro-phenol	2,4-Dimethyl-phenol
B 1011	0.5-1.5'	-	-	-	-	-
	5.5-6.5'	-	-	-	-	-
B 1012	0-2'	-	-	-	-	-
	6-8'	-	-	-	-	-
B 1013	0-2'	28.	-	-	-	-
	5-7'	-	-	-	-	-
	9-12'	3.2	0.3	0.3	2.6	1.0
B 1014	0-2'	3.2	-	-	-	-
	4-6'	2.0	-	-	-	-
	6-8'	1.4	-	-	-	
	8-10'	-	-	-	-	-
	10-12'	-	-	-	-	-
B 1015	0-2'	-	-	-	-	-
	4-6'	-	-	-	-	-
	6-8'	-	-	-	-	-
B 1016	0-2'	-	-	-	-	-
	4-6'	-	-	-	-	-
	8-10'	-	-	-	-	-
B 1017	0-2'	-	-	-	-	-
	4-6'	-	-	-	-	-
	13-15'	-	-	-	-	-
B 1018	0-2'	1.9	-	-	-	-
	4-6'	-	-	-	-	-
	8-10'	-	-	-	-	-
	14-16'	2.9	-	-	-	-
B 1019	0-2'	-	-	-	-	-
	4-6'	13.	-	-	-	-
	8-10'	23.	-	-	-	-
B 1020	0-2'	-	-	-	-	-
	4-6'		-	-	-	-
	8-10'	4.6	-	-	-	-

Note: Locations of borings listed in this table may be found in Figure 5.4 Only compounds which were detected in one or more samples are reported.

* Sample not analyzed (broken container)

MAC/SY027/00029

Chemical Sewer Lagoon

A lagoon to impound process wastewaters was located southeast of the CWL, as shown in Figure 5.1. The lagoon, referred to by plant personnel as the chemical sewer lagoon (CSL), was closed in 1957 and replaced by the chemical lagoons (see Figure 5.1). The lagoon was filled in and a building was placed over it.

Both Weston and ES investigated the CSL during Phase 1. Weston excavated a trench near the northern boundary of the CSL and collected samples of soil from the trench sides and bottom. This sampling location was referred to as TP-13. (See Figure 5.5 for the location of TP-13). Weston's samples were analyzed for PCBs, EP toxicity extraction metals and volatile organics. ES excavated two trenches in the same vicinity in October, 1983. These were referred to as the north and south trenches. Samples of both soil and groundwater were collected from both trenches and analyzed for the priority pollutants. Also during Phase 1 ES performed borings in the area to determine the vertical and horizontal extent of the CSL. Samples from these test borings were analyzed for PCBs and volatile organics. (These were referred to as test borings 1 through 9). All ES sample locations in the CSL area during Phase 1 may be found in Figure 5.5. Figure 5.6 shows cross sections of the CSL which were developed from the ES Phase 1 borings.

Buried drums were found in the 1982 Weston test pit excavation (TP-13) and in the ES South Trench excavation in 1983. The three drums found by Weston at 8 foot depth in the east end of the trench and the several drums found by ES were unmarked, broken, and corroded. One drum from Weston's trench contained a black, oily liquid (Sample W-4, Table 5.3) and one drum in the ES trench contained a tar-like substance (sampled as Drum Liquid, Table 5.4). The other drums contained what appeared to be the surrounding soil.

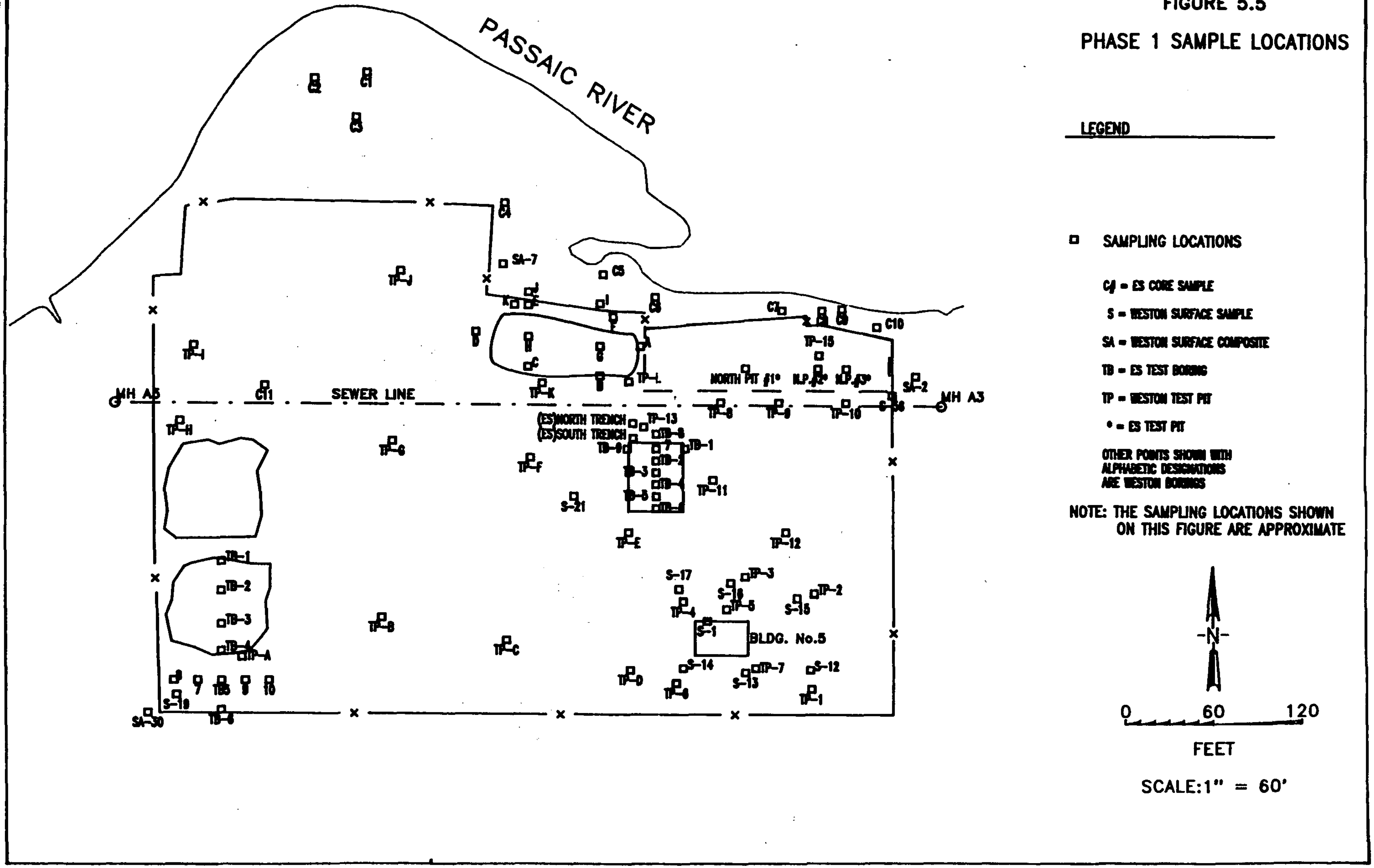
ES conducted a supplemental investigation of the CSL during Phase 2. 17 test borings were conducted in the vicinity of the CSL as shown in Figure 5.7. These borings were all advanced from the ground surface to the top of the glacial lake deposits. Soil samples were collected from each boring at various depths and analyzed for PCBs, organic chemicals, and (in some cases) metals. No drums were found.

Phase 1 analytical results for Weston's samples from the CSL are given in Table 5.3. These results indicate high concentrations of chlorobenzene and moderate concentrations of ethylbenzene and toluene in the soil at the northern boundary of the CSL. Table 5.4 gives the results of all Phase 1 samples collected by ES. Examination of Table 5.4 indicates only moderate concentrations of chlorobenzene and ethylbenzene. Base/neutral compounds are present in low to moderate concentrations. Table 5.5 gives analytical results for all samples collected from the CSL during Phase 2. Examination of Table 5.5 indicates high concentrations of ethylbenzene and

ES ENGINEERING-SCIENCE

FIGURE 5.5

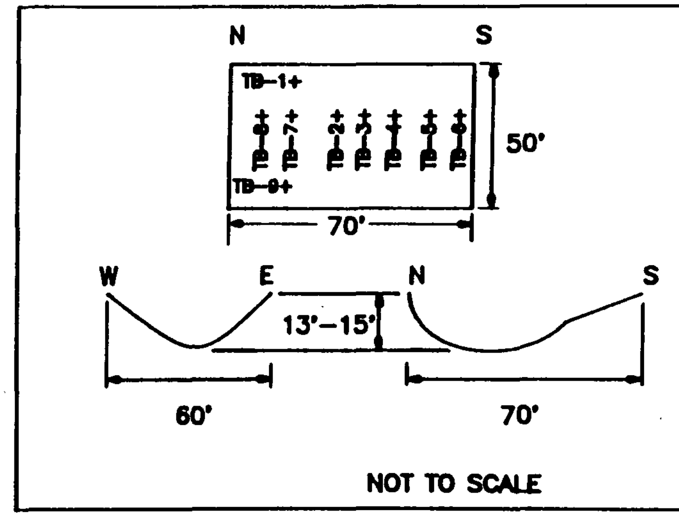
PHASE 1 SAMPLE LOCATIONS



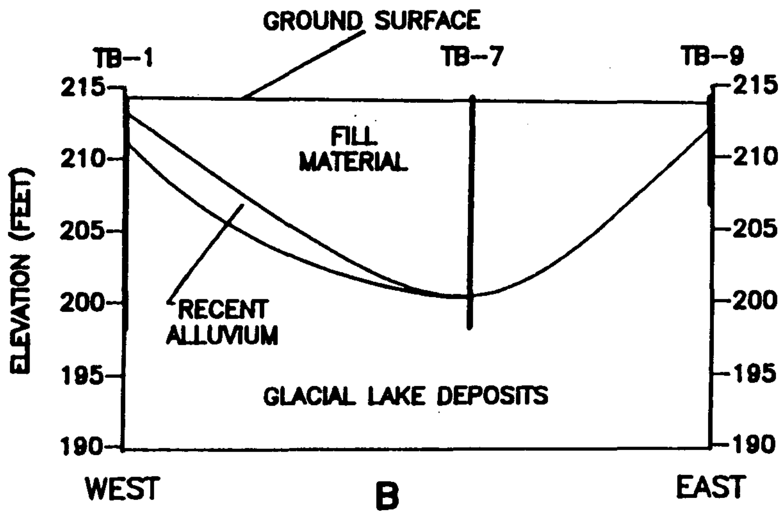
BH/B:BHB.b

FIGURE 5.6

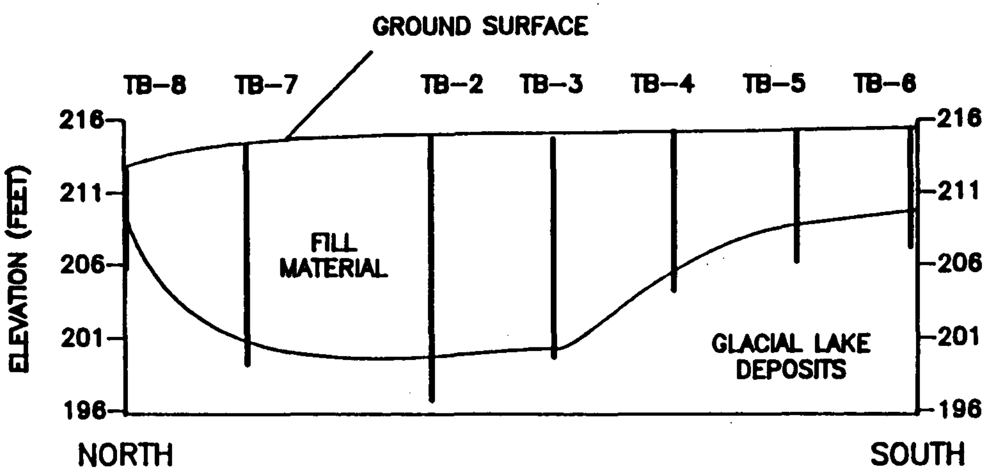
OLD CHEMICAL SEWER LAGOON CROSS SECTIONS



A
CHEMICAL SEWER LAGOON



B
CHEMICAL SEWER LAGOON
EAST-WEST CROSS SECTION



C
CHEMICAL SEWER LAGOON
NORTH-SOUTH CROSS SECTION

TABLE 5.3

SOIL ANALYSIS RESULTS
OLD CHEMICAL SEWER LAGOON AREA
ROY F. WESTON
(OCTOBER, 1982)

Sample Number	Location and Depth	PCB (mg/kg dry weight)	Percent Moisture	Volatile Organic** (mg/kg)
S-47	TP-13, 8' dp (oily sludge)	<50.0	9.1	Ethylbenzene 85 Toluene 12
S-48	TP-13, 0-6"	<5.0	1.1	Chlorobenzene 18
S-49	TP-13,6-12"	<5.0	0.5	Chlorobenzene <0.8
S-59	TP-13,12-18"	<5.0	0.6	Chlorobenzene 1.0
S-51	TP-13, 18-24"	<5.0	0.9	Chlorobenzene 0.9
S-52	TP-13,24-36"	<5.0	3.0	Chlorobenzene 137 Ethylbenzene 2
S-52 (duplicate)				Chlorobenzene 191 Ethylbenzene 3
W-4*	TP-13, 8' dp (oily drum liquid)	<5.0	-	Ethylbenzene 4 Toluene <0.8

* EP toxicity metals Cr 0.17 mg/l.
As 0.03 mg/l.

** Samples analyzed for priority pollutant volatiles. Only compounds which were detected are reported.

Note: For location of TP-13 see Figure 5.5.

MAC/SY027/00018

TABLE 5.4

OLD CHEMICAL SEWER LAGOON ANALYTICAL DATA (PHASE I)
(ALL RESULTS IN MG/KG OR MG/L, AS APPLICABLE)
(LOCATIONS OF SAMPLING POINTS MAY BE FOUND IN FIGURE 5.5)

Sampling Point/Parameter	NPDES Number	Concentration
North Trench - Soil		
Chlorobenzene	7V	8.3
Ethylbenzene	19V	15.7
Methylene chloride	22V	3.3
Benzo(b)fluoranthene	7B	0.7[1]
Benzo(k)fluoranthene	9B	0.7[1]
Chrysene	18B	0.6
Fluoranthene	31B	0.7
Phenanthrene	44B	0.5
Pyrene	45B	0.6
Phenolics, total	15M	7
North Trench - Liquid		
Chlorobenzene	7V	1.0
Ethylbenzene	19V	0.5
Methylene chloride	22V	0.7
1,2-Dichlorobenzene	20B	0.05
Chromium	5M	0.02
Copper	6M	0.04
Mercury	8M	<0.01
Zinc	13M	0.02
Phenolics, total	15M	1.4
South Trench - Soil		
Ethylbenzene	19V	64.2
Benzo(b)fluoranthene	7B	3.8[1]
Benzo(k)fluoranthene	9B	3.8[1]
1,2-Dichlorobenzene	20B	4.4
Pyrene	45B	3.3
Phenolics, total	15M	9
South Trench - Liquid		
Chlorobenzene	7V	5.3
Ethylbenzene	19V	2.8
Methylene chloride	22V	0.6
Toluene	25V	1.1
4-Nitrophenol	7A	2.9
1,2-Dichlorobenzene	20B	0.6
Arsenic	2M	<0.01
Chromium	5M	0.01
Copper	6M	0.03
Nickel	9M	0.01
Zinc	13M	0.02
Phenolics, total	15M	3.0

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TABLE 5.4, CONTINUED

Sampling Point/Parameter	NPDES Number	Concentration
Drum - Liquid		
Ethylbenzene	19V	8.3
Methylene chloride	22V	3.5
Toluene	25V	3.0
Phenol	10A	66.8
Chromium	5M	66
Copper	6M	79
Lead	7M	11
Nickel	9M	25
Zinc	13M	170
Phenolics, total	15M	10,400
Test Boring #1		
Chlorobenzene	7V	<0.1
Ethylbenzene	19V	0.3
Test Boring #2		
Benzene	3V	0.5
Chlorobenzene	7V	0.2
1,2-Dichloroethane	15V	1.0
Ethylbenzene	19V	7.2
Toluene	25V	3.8
Test Boring #3		
Chlorobenzene	7V	0.1
Ethylbenzene	19V	0.8
Toluene	25V	0.2
Test Boring #4		
Ethylbenzene	2V	13.8
Test Boring #5		
Acrylontrile	2V	0.6
Ethylbenzene	19V	1.5
Test Boring #6		
Ethylbenzene	19V	0.8
Test Boring #7		
Benzene	3V	2.1
Chlorodibromomethane	8V	1.4
Chloroform	11V	0.5
1,2-Dichloroethane	15V	2.2
Ethylbenzene	19V	26.0
Toluene	25V	11.7
Test Boring #8		
None Detected		

TABLE 5.4, CONTINUED

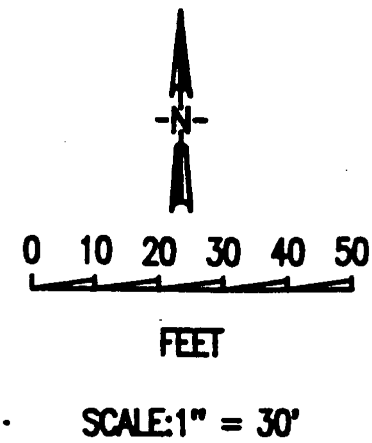
Sampling Point/Parameter	NPDES Number	Concentration
<u>Test Boring #9</u>		
Chlorobenzene	7V	1.6
1,2-Dichloroethane	15V	1.3
Ethylbenzene	19V	11.1
Tetrachloroethylene	24V	0.4
Toluene	25V	0.7

1 Reported as isometric pair.
Note: Only compounds which were detected are reported.

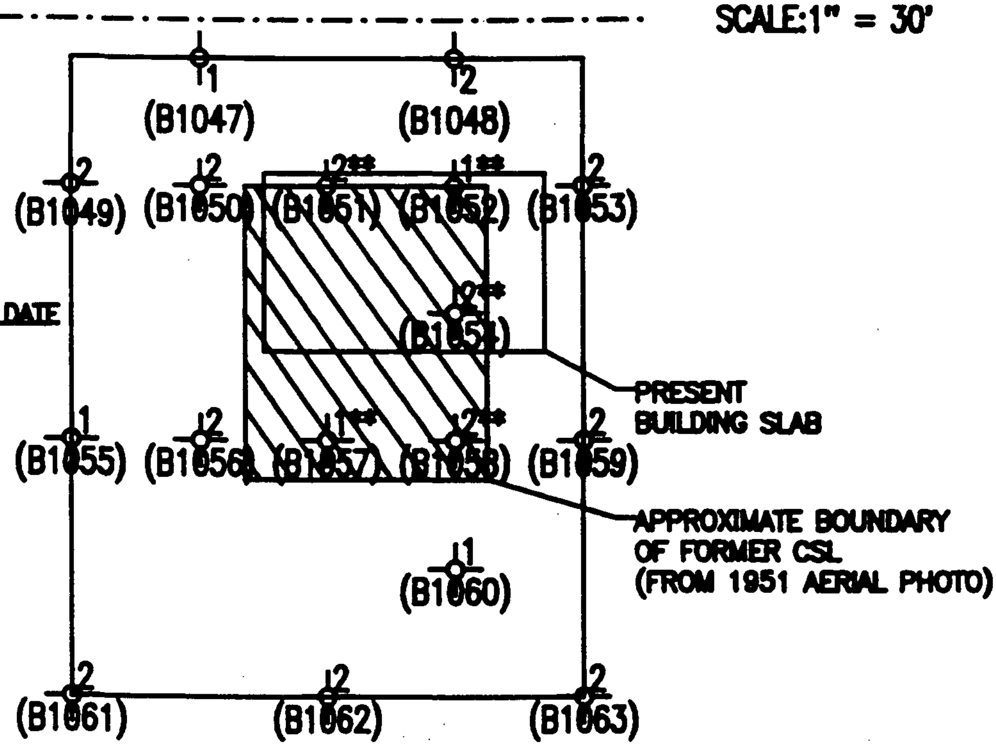
ES ENGINEERING-SCIENCE

FIGURE 5.7

PHASE 2
SITE INVESTIGATION
SAMPLE LOCATION:
CHEMICAL SEWER LAGOON

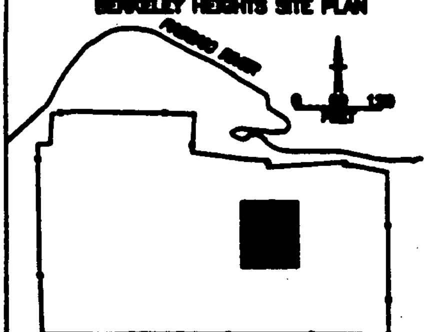


SEWER LINE



BORING NO.	COMPLETION DATE
B1047	9/23/85
B1048	9/24/85
B1049	9/06/85
B1050	9/25/85
B1051	9/26/85
B1052	9/25/85
B1053	9/25/85
B1054	9/26/85
B1055	9/06/85
B1056	9/09/85
B1057	9/23/85
B1058	9/26/85
B1059	9/25/85
B1060	9/25/85
B1061	9/24/85
B1062	9/25/85
B1063	9/24/85

BERKELEY HEIGHTS SITE PLAN



BORING LOCATIONS

1 SAMPLES ANALYZED FOR PRIORITY POLLUTANTS PLUS 40 PEAKS

2 SAMPLES ANALYZED FOR INDICATOR PARAMETERS

** CONTINUOUS SAMPLING (ASTM D1586)

NOTE: THE SAMPLING LOCATIONS SHOWN ON THIS FIGURE ARE APPROXIMATE AND MAY HAVE CHANGED SLIGHTLY DUE TO FIELD CONDITIONS

TABLE 5.5

RESULTS OF PHASE 2 CHEMICAL SEWER LAGOON SAMPLING
(ALL RESULTS IN MG/KG)

Boring Number	Depth	Ethylbenzene	Chlorobenzene	Benzene	Toluene	Xylene	Acetone	1,2-Dichloro-ethane	1,2-Trans-dichloroethene	Trichloro-ethene	1,1,2,2-Tetra-chloroethane	Chloroform	Methylene chloride	Arsenic	Beryllium
B 1047	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6
	5-7'	12.0	14.0	-	-	120.0	-	-	-	-	-	-	-	1.9	1.2
	10-11.5'	-	4.4	-	.09	9.7	1.4	.06	.14	.05	.03	-	-	3.8	1.4
B 1048	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	61.0	-	-	4.9	-	-	-	-	-	-	-	-	-	-
	10-12'	4.4	.24	.14	.42	-	-	-	-	-	-	-	-	-	-
B 1049	1-2'	.04	.50	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-7'	.08	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1050	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	.04	.05	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	.13	.50	-	-	-	-	-	-	-	-	-	-	-	-
B 1051	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6-8'	8.6	2.5	-	.78	-	-	-	-	-	-	-	-	-	-
	8-10'	73.	-	-	9.8	-	-	-	-	-	-	-	-	-	-
	10-12'	230.0	-	-	38.0	-	-	-	-	-	-	-	-	-	-
B 1052	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	3.6	0.5
	4-6'	46.0	-	-	3.8	330.0	-	16.0	-	-	-	-	-	4.8	1.2
	10-12'	.39	-	.05	.29	2.8	31.0	5.0	-	-	-	.25	.37	4.5	1.5

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TABLE 5.5, CONTINUED

Boring Number	Depth	Ethylbenzene	Chlorobenzene	Benzene	Toluene	Xylene	Acetone	1,2-Dichloro-ethane	1,2-Trans-dichloroethene	Trichloro-ethene	1,1,2,2-Tetra-chloroethane	Chloroform	Methylene chloride	Arsenic	Beryllium
B 1053	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-4'	1.9	.04	.05	.05	-	-	-	-	-	-	-	-	-	-
	4-6'	94.0	-	-	6.3	-	-	-	-	-	-	-	-	-	-
	10-12'	.90	.43	.16	.38	-	-	-	-	-	-	-	-	-	-
B 1054	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	112.0	5.5	-	3.7	-	-	-	-	-	-	-	-	-	-
B 1055	0.8-1.5'	.94	-	-	.02	4.9	1.4	-	-	-	-	-	-	2.1	0.8
	5.5-7'	15.0	-	-	-	160.0	-	-	-	-	-	-	-	3.2	0.6
	10.5-11.5'	5.4	-	-	.10	48.0	-	-	-	-	-	-	-	3.3	0.8
B 1056	1.5-3'	-	-	-	-	-	-	-		-	-	-	-	-	-
	5.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.5-11.5'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1057	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	1.9	0.8
	4-6'	4.4	-	-	.14	35.0	-	-	-	-	-	-	.86	1.3	0.6
	14-16'	.38	-	-	-	1.2	-	-	-	-	-	-	-	-	-
B 1058	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	.80	-	.37	.17	-	-	-	-	-	-	-	-	-	-
	6-8'	19.0	-	-	1.2	-	-	-	-	-	-	-	-	-	-
	10-12'	30.0	-	-	1.9	-	-	-	-	-	-	-	-	-	-
	13.5-15.5'	9.4	-	-	.37	-	-	-	-	-	-	-	-	-	-
B 1059	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	1.2	-	.37	.03	-	-	-	-	-	-	-	-	-	-
	10-12'	.28	.07	1.1	.04	-	-	-	-	-	-	-	-	-	-

TABLE 5.5, CONTINUED

Boring Number	Depth	Ethylbenzene	Chlorobenzene	Benzene	Toluene	Xylene	Acetone	1,2-Dichloro-ethane	1,2-Trans-dichloroethene	Trichloro-ethene	1,1,2,2-Tetra-chloroethane	Chloroform	Methylene chloride	Arsenic	Beryllium
B 1060	5-7'	25.0	-	-	-	140.0	-	-	-	-	-	-	-	3.9	-
	10-12'	13.0	-	-	.07	72.0	.88	-	-	-	-	-	-	3.6	1.3
	15-17'	1.2	.05	.36	.12	-	-	-	-	-	-	-	-	-	-
B 1061	0.5-2.5'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1062	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	2.2	-	.36	.07	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1063	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 5.5, CONTINUED

Boring Number	Depth	Chromium	Copper	Lead	Mercury	Nickel	Thallium	Zinc	Cyanide, total	Phenolics, total	PCB	bis(2-Ethylhexyl) phthalate	Naphthalene	Fluorene	Phenanthrene
B 1047	0-2'	17.	31.	-	0.8	55.	0.04	180.	-	0.9	.98	-	-	-	-
	5-7'	29	19.	-	-	26.	0.10	84.	-	-	.06	-	-	-	-
	10-11.5'	42	29.	-	-	43.	0.15	190.	-	0.5	-	-	-	-	-
B 1048	0-2'	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-
	5-7'	-	-	-	-	-	-	-	-	0.8	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	6.7	-	5.8	-	-	-
B 1049	1-2'	-	-	-	-	-	-	-	-	0.26	.51	-	-	-	-
	5.5-7'	-	-	-	-	-	-	-	-	0.70	-	-	-	-	-
B 1050	0-2'	-	-	-	-	-	-	-	-	0.7	.44	-	-	-	.70
	5-7'	-	-	-	-	-	-	-	-	0.5	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	0.5	-	-	-	-	-
B 1051	0-2'	-	-	-	-	-	-	-	-	1.6	.23	3.8	-	-	1.0
	6-8'	-	-	-	-	-	-	-	-	8.4	-	-	-	-	.20
	8-10'	-	-	-	-	-	-	-	-	27.	-	3.1	-	-	.20
	10-12'	-	-	-	-	-	-	-	-	57.	-	-	-	-	-
B 1052	0-2'	15.	29.	63.	1.7	12.	0.04	111.	-	1.0	1.1	1.2	-	-	.20
	4-6'	41.	19.	24.	0.1	33.	0.09	177.	-	1.1	-	-	-	-	-
	10-12'	45.	30.	32.	-	44.	0.12	123.	-	1.6	-	-	-	-	-
B 1053	0-2'	-	-	-	-	-	-	-	-	-	9.0	-	-	-	-
	2-4'	-	-	-	-	-	-	-	-	-	2.9	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	1.3	.27	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	2.1	-	-	-	-	-
B 1054	0-2'	-	-	-	-	-	-	-	-	0.8	.50	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	1.4	.58	1.5	-	-	.30

TABLE 5.5, CONTINUED

Boring Number	Depth	Chromium	Copper	Lead	Mercury	Nickel	Thallium	Zinc	Cyanide, total	Phenolics, total	PCB	bis(2-Ethylhexyl) phthalate	Naphthalene	Fluorene	Phenanthrene
B 1055	0.8-1.5'	21.	25.	43.	-	19.	0.15	55.	-	0.73	-	-	-	-	-
	5.5-7'	18.	15.	93.	-	-	0.14	33.	-	0.50	-	7.4	-	-	-
	10.5-11.5'	19.	20.	77.	-	16.	0.18	55.	-	0.72	-	-	-	-	-
B 1056	1.5-3'	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-
	5.5-6.5'	-	-	-	-	-	-	-	-	0.7	-	-	-	-	-
	10.5-11.5'	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-
B 1057	0-2'	16.	8.	181.	-	12.	0.07	160.	-	0.8	17.0	5.7	.10	.20	1.7
	4-6'	12.	8.	71.	-	9.	0.04	49.	-	1.1	.55	-	-	.10	.80
	14-16'	-	-	-	-	-	-	-	-	-	-	1.6	-	-	-
B 1058	0-2'	-	-	-	-	-	-	-	-	1.0	2.0	2.5	-	-	6.4
	4-6'	-	-	-	-	-	-	-	-	0.8	-	7.4	-	-	-
	6-8'	-	-	-	-	-	-	-	-	5.1	-	7.9	-	-	.30
	10-12'	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-
	13.5-15.5'	-	-	-	-	-	-	-	-	3.5	-	3.6	-	-	.40
B 1059	0-2'	-	-	-	-	-	-	-	-	0.9	7.5	-	-	-	-
	5-7'	-	-	-	-	-	-	-	-	0.9	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	16.	-	1.1	-	-	-
B 1060	5-7'	24.	14.	-	-	33.	.02	129.	-	-	-	-	-	-	-
	10-12'	44.	24.	35.	0.2	35.	0.12	122.	-	-	-	2.5	-	-	-
	15-17'	-	-	-	-	-	-	-	-	0.2	-	1.7	-	-	-
B 1061	0.5-2.5'	-	-	-	-	-	-	-	-	1.3	3.0	3.6	-	-	-
	9-11'	-	-	-	-	-	-	-	-	1.1	.10	2.2	-	-	-

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TABLE 5.5, CONTINUED

Boring Number	Depth	Chromium	Copper	Lead	Mercury	Nickel	Thallium	Zinc	Cyanide, total	Phenolics, total	PCB	bis(2-Ethylhexyl) phthalate	Naphthalene	Fluorene	Phenanthrene
B 1062	0-2'	-	-	-	-	-	-	-	-	0.4	1.7	1.1	-	-	.10
	5-7'	-	-	-	-	-	-	-	-	1.2	-	1.8	-	-	-
	10-12'	-	-	-	-	-	-	-	-	0.3	-	3.9	-	-	-
B 1063	0-2'	-	-	-	-	-	-	-	-	0.6	48.	2.1	-	-	.40
	4-6'	-	-	-	-	-	-	-	-	0.4	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	0.6	-	-	-	-	-

TABLE 5.5, CONTINUED

Boring Number	Depth	Anthracene	Fluoranthene	Pyrene	Benzo(a)-anthracene	Chrysene	Benzo(a)-pyrene	Indeno-(1,2,3-c,d)-pyrene	Dibenzo(a,h)-anthracene	Benzo(ghi)-perylene	1,2-Dichloro-benzene	Diethyl phthalate	Benzo(b)-fluoranthene, Benzo(k) fluoranthene	Di-n-octyl-phthalate
B 1047	0-2'	-	-	-	-	-	-	-	-	-	.50	17.0	-	-
	5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-11.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1048	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1049	1-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1050	0-2'	-	1.5	1.3	.80	.70	.90	-	-	-	-	-	1.4	-
	5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1051	0-2'	-	1.8	1.3	.80	.80	.90	-	-	-	-	-	1.4	-
	6-8'	-	.20	.20	.10	-	-	-	-	-	-	-	.20	-
	8-10'	-	-	-	-	-	-	-	-	-	.10	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1052	0-2'	-	.40	.40	.20	.20	-	-	-	-	.50	-	.40	.10
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1053	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-4'	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	.40	-	-	-

TABLE 5.5, CONTINUED

Boring Number	Depth	Anthracene	Fluoranthene	Pyrene	Benzo(a)-anthracene	Chrysene	Benzo(a)-pyrene	Indeno-(1,2,3-c,d)-pyrene	Dibenzo(a,h)-anthracene	Benzo(ghi)-perylene	1,2-Dichloro-benzene	Diethyl phthalate	Benzo(b)-fluoranthene, Benzo(k) fluoranthene	Di-n-octyl-phthalate
B 1054	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	.30	.20	.10	.10	-	-	-	-	.30	-	.20	-
B 1055	0.8-1.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.5-11.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1056	1.5-3'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.5-11.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1057	0-2'	-	1.6	2.8	1.2	1.4	.30	.90	.50	.80	-	-	2.1	-
	4-6'	0.20	.90	1.1	.60	.50	.70	-	-	-	-	-	.90	-
	14-16'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1058	0-2'	-	-	.90	1.2	1.3	.70	-	-	-	-	-	.40	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-
	6-8'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.5-15.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1059	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1060	5-7'	-	-	-	-	-	-	-	-	-	-	.80	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	.20	-	-
	15-17'	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 5.5, CONTINUED

Boring Number	Depth	Anthracene	Fluoranthene	Pyrene	Benzo(a)-anthracene	Chrysene	Benzo(a)-pyrene	Indeno-(1,2,3-c,d)-pyrene	Dibenzo(a,h)-anthracene	Benzo(ghi)-perylene	1,2-Dichloro-benzene	Diethyl phthalate	Benzo(b)-fluoranthene, Benzo(k) fluoranthene	Di-n-octyl-phthalate
B 1061	0.5-2.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	.40	-	-	-	-	-	-	-	-
B 1062	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1063	0-2'	-	.70	.90	.40	.50	-	-	-	-	-	-	.60	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 5.5, CONTINUED

Boring Number	Depth	Di-n-butyl-phthalate	2,4-Dimethyl-phenol	2,4,6-Tri-chlorophenol
B 1047	0-2'	-	-	-
	.5-7'	-	-	-
	10-11.5'	-	-	-
B 1048	0-2'	-	-	-
	5-7'	-	-	-
	10-12'	-	-	-
B 1049	1-2'	-	-	-
	5.5-7'	-	-	-
B 1050	0-2'	-	-	-
	5-7'	-	-	-
	10-12'	-	-	-
B 1051	0-2'	-	-	-
	6-8'	-	-	-
	8-10'	-	-	-
	10-12'	-	-	-
B 1052	0-2'	-	.20	2.0
	4-6'	-	-	-
	10-12'	-	-	-
B 1053	0-2'	-	-	-
	2-4'	-	-	-
	4-6'	-	-	-
	10-12'	-	-	-
B 1054	0-2'	-	-	-
	4-6'	-	-	-

TABLE 5.5, CONTINUED

Boring Number	Depth	Di-n-butyl-phthalate	2,4-Dimethyl-phenol	2,4,6-Tri-chlorophenol
B 1055	0.8-1.5'	-	-	-
	5.5-7'	-	-	-
	10.6-11.6'	-	-	-
B 1056	1.6-3'	-	-	-
	5.5-6.5'	-	-	-
	10.5-11.5'	-	-	-
B 1057	0-2'	0.1	-	-
	4-6'	-	-	-
	14-16'	-	-	-
B 1058	0-2'	-	-	-
	4-6'	-	-	-
	6-8'	-	-	-
	10-12'	-	-	-
	13.5-15.5'	-	-	-
B 1059	0-2'	-	-	-
	5-7'	-	-	-
	10-12'	-	-	-
B 1060	5-7'	-	.60	-
	10-12'	-	-	-
	15-17'	-	-	-
B 1061	0.5-2.5'	-	-	-
	9-11'	-	-	-

TABLE 5.5, CONTINUED

Boring Number	Depth	Di-n-butyl-phthalate	2,4-Dimethyl-phenol	2,4,6-Tri-chlorophenol
B 1062	0-2'	-	-	-
	5-7'	-	-	-
	10-12'	-	-	-
B 1063	0-2'	-	-	-
	4-6'	-	-	-
	9-11'	-	-	-

Note: Locations of borings shown on this figure may be found in Figure 5.7.

Only compounds which were detected in one or more samples are shown.

moderate concentrations of chlorobenzene in some locations. Additionally, moderate concentrations of PCBs and high concentrations of base/neutral compounds may be found at some locations.

No samples collected in the CSL during Phase 2 exhibited concentrations of priority pollutant metals outside the "typical" background range for soils as found in the literature (see Appendix R). Therefore, the CSL is not a source of metals contamination on the site.

The high concentrations of the contaminants mentioned above and their apparent movement from the CSL make this area one of the primary sources of contamination on the site.

Chemical Lagoons

The location of the two impoundments referred to by the plant as the chemical lagoons is shown in Figure 5.1. The configuration of the lagoons in Figure 5.1 is based upon aerial photos taken in 1969 (See Appendix K). The two lagoons were used as oil/water separation devices. The south lagoon was the first in the series followed by the north lagoon. These lagoons were used during the period between the closing of the CSL and 1974 to store process wastewater. They were taken out of service and backfilled at that time. A wastewater holding tank was constructed at the site of the south lagoon, while a slab was placed over the north lagoon which was used as a drum storage area.

ES investigated the south chemical lagoon (SCL) as part of Phase 1. Ten test borings were completed in the vicinity of the SCL to define the vertical and horizontal extent of the lagoon. Soil samples were collected from each of the borings and analyzed for PCBs and volatile organics. Figure 5.8 depicts the cross-section of the SCL as determined by the Phase 1 borings. ES again performed borings in the area of the SCL and around the periphery of the north chemical lagoon (NCL) during Phase 2. The north chemical lagoon proper was not investigated by ES during either Phase 1 or Phase 2 because the location of the Interim Remedial Action Soil Storage Area prevented it (see section later in this chapter about the soil storage area). All the Phase 2 borings in this area were completed to the top of the glacial lake deposits. Soil samples were collected from each of the borings at various depths and analyzed for PCBs, organic chemicals and (in some cases) metals.

The analytical results of Phase 1 ES soil samples in the SCL are given in Table 5.6. Examination of this table reveals that only low to moderate levels of ethylbenzene and chlorobenzene were found in the SCL. One boring (near the north end of the lagoon) contained high levels of PCBs. Table 5.7 contains the analytical results from the Phase 2 sampling in the vicinity of the NCL and SCL. Phase 2 results reveal that, as before for Phase 1, low to moderate

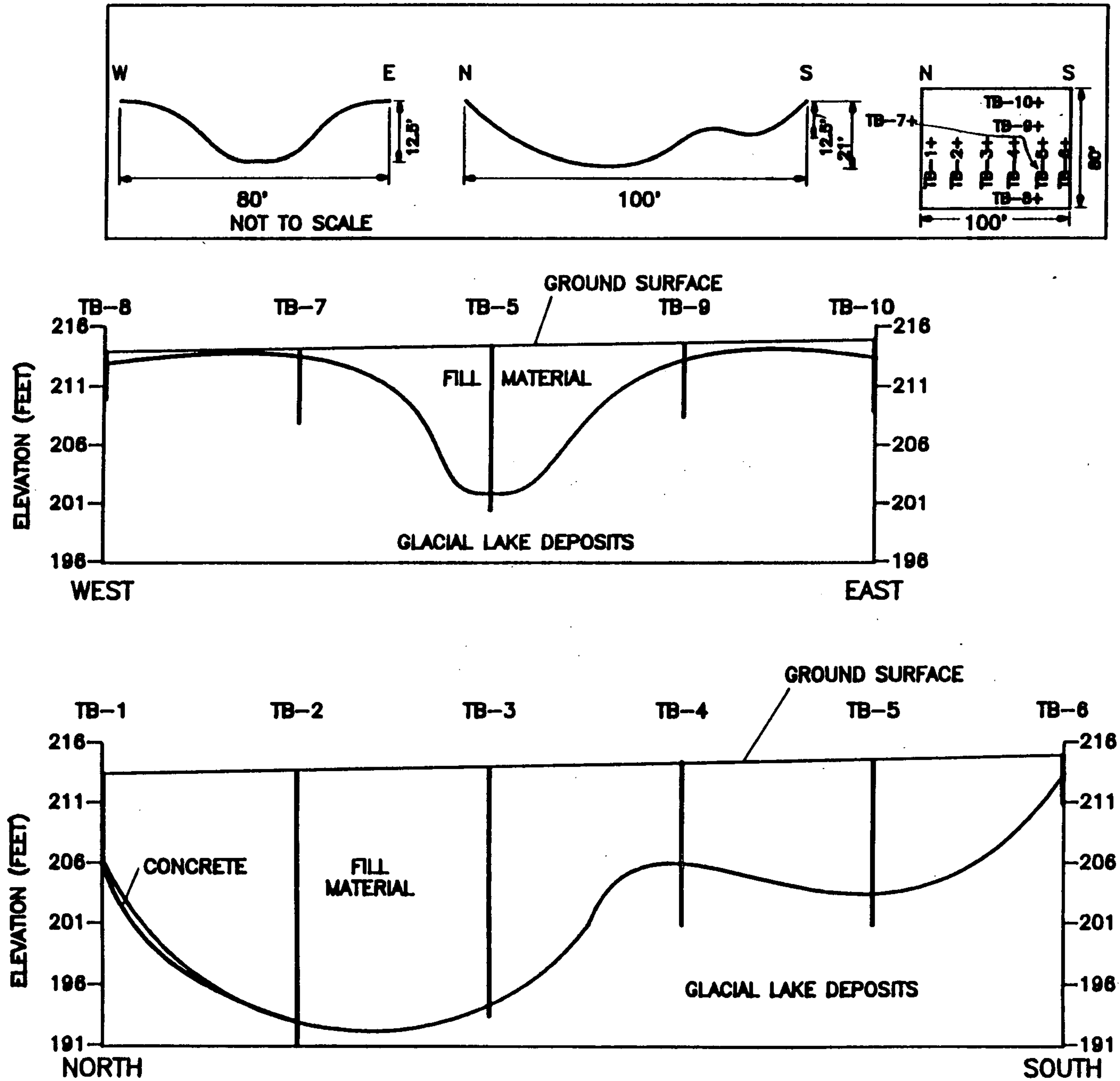

FIGURE 5.8

SOUTH CHEMICAL LAGOON CROSS SECTIONS

A
CHEMICAL LAGOON

B
CHEMICAL LAGOON EAST–WEST CROSS SECTION

C
CHEMICAL LAGOON NORTH–SOUTH CROSS SECTION

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TABLE 5.6

PHASE 1 CHEMICAL LAGOON SOIL BORING ANALYTICAL DATA

Test Boring Number	Chlorobenzene (mg/kg)	Ethylbenzene (mg/kg)	Arochlor - 1248 (mg/kg)
1	BMDL(0.3)	0.3	BMDL(3.3)
2	3.2	9.7	113.0
3	BMDL(0.3)	3.3	ND
4	ND		NDND
5	BMDL(0.3)	BMDL(0.3)	ND
6	BMDL(0.1)	ND	ND
7	BMDL(0.1)	BMDL(0.1)	BMDL(0.3)
8	BMDL(0.2)	ND	0.4
9	ND	ND	BMDL(0.3)
10	ND	ND	BMDL(1.7)

ND None Detected

BMDL Below method detection limit. Method detection limit for test is in parentheses, e.g., BMDL(0.3).

Note: Locations of borings shown on this table may be found in Figure 5.5.

Only volatile compounds above the method detection limit are reported.

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TABLE 5.7

RESULTS OF PHASE 2 CHEMICAL LAGOON SAMPLING (ALL RESULTS IN MG/KG)

Boring Number	Depth	Chlorobenzene	Acetone	Methylene chloride	Xylene	Chloroform	Ethyl-benzene	Methy isobutyl ketone	1,1,1-Tri-chloroethane	Arsenic	Beryllium	Chromium	Copper	Lead	Zinc
B1065	1-2'	-	-	-	-	-	-	-	-	2.5	60.	13.	26.	65.	111.
	6-7'	-	8.8	-	-	-	-	-	-	2.5	1.0	25.	18.	-	113.
	11-12'	-	-	-	.13	-	-	-	-	1.5	.80	23.	39.	-	94.
B1066	1.5-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B1067	1-2'	-	-	-	-	-	-	-	-	1.0	1.0	18.	41.	57.	106.
	5.5-7'	-	-	190.	1100.	5.3	110.	-	-	1.3	.80	19.	15.	35.	125.
	9-11'	-	-	-	200.	-	18.	7.0	-	1.8	1.2	13.	26.	64.	140.
B1068	1.5-2'	-	-	-	-	-	-	-	-	0.3	.60	16.	82.	57.	168.
	5.5-7'	-	87.	68.	420.	-	67.	-	-	2.2	.80	23.	55.	219.	113.
	15.5-16.5'	-	3.3	-	.84	-	.15	-	-	1.9	1.2	26.	50.	56.	114.
B1090	0.5-2'	-	-	-	-	-	-	-	-	2.1	.55	43.	300.	180.	210.
	13.5-15'	.10	-	-	.16	-	.07	-	-	1.3	.55	39.	87.	190.	206.
B1091	0.5-2'	-	-	-	-	-	-	-	-	1.6	.60	12.	23.	70.	121.
	6-7'	-	-	.17	3.1	-	.07	-	.03	1.6	.70	38.	114.	163.	167.
	18-19'	-	-	-	59.	-	5.9	-	-	.30	.30	20.	31.	43.	193.

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TABLE 5.7 (CONTINUED)
(ALL RESULTS IN MG/KG)

Boring Number	Depth	Nickel	Mercury	Thallium	Cyanide, Total	Phenolics, Total	Selenium	PCB	4,4'-DDE	Beta-BHC	4,4'-DDD	4,4'-DDT	Total DDTs	Cadmium	Silver
B1065	1-2'	13.	.2	-	-	-	.05	.27	.02	-	-	.07	.09	-	-
	6-7'	22.	.1	-	-	-	-	.58	-	-	-	-	-	-	-
	11-12'	24.	.2	.81	-	.6	-	.04	-	-	-	-	-	-	-
B1066	1.5-2'	-	-	-	-	-	-	3.6	-	-	-	-	-	-	-
	5.5-7'	-	-	-	-	-	-	.08	-	-	-	-	-	-	-
B1067	1-2'	22.	.5	.09	-	-	-	20.	-	-	-	-	-	3.0	-
	5.5-7'	20.	-	.07	-	3.5	-	1.3	-	-	-	-	-	-	-
	9-11'	32.	-	.14	-	.3	-	1.8	-	-	-	-	-	3.0	-
B1068	1.5-2'	19.	.8	.06	-	.5	.09	8.4	-	-	-	-	-	-	5.0
	5.5-7'	22.	.1	.08	-	-	-	25.	-	-	-	-	-	-	-
	15.5-16.5'	35.	-	.13	.4	.3	-	-	-	-	-	-	-	-	-
B1090	0.5-2'	22.	8.1	.07	-	.5	-	-	1.2	7.3	32.	.76	42.1	-	-
	13.5-15'	25.	2.7	-	-	.6	-	182.	-	-	-	-	-	-	-
B1091	0.5-2'	13.	.2	.09	.4	.2	-	-	.04	-	.05	.08	.17	-	-
	6-7'	23.	1.3	.11	-	-	-	13.	-	-	-	-	-	-	-
	18-19'	28.	3.5	-	-	-	-	3.2	-	-	-	-	-	-	-

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TABLE 5.7 (CONTINUED)
(ALL RESULTS IN MG/KG)

Boring Number	Depth	Chlordane	Heptachlor	Phenanthrene	Fluoranthene	Pyrene	Benzo(a)-anthracene	Napthalene	1,2-Dichloro-benzene	Fluorene	Anthracene	Chrysene	Benzo(b)-fluoranthene, Benzo(k)-fluoranthene
B1065	1-2'	4.5	.06	1.7	2.4	4.7	3.1	-	-	-	-	1.7	3.7
	6-7'	-	-	-	-	-	-	-	-	-	-	-	-
	11-12'	-	-	-	-	-	-	-	-	-	-	-	-
B1066	1.5-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-7'	-	-	-	-	-	-	-	-	-	-	-	-
B1067	1-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-7'	-	-	.60	7.1	-	-	.20	1.0	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-
B1068	1.5-2'	-		-	-	-	-	-	-	-	-	-	-
	5.5-7'	-	-	-	-	-	-	-	4.1	-	-	-	-
	15.5-16.5'	-	-	-	-	-	-	-	-	-	-	-	-
		-											
B1090	0.5-2'	-		-	1.1	1.8	-	-	-	-	-	-	-
	13.5-15'	-	-	7.5	5.1	4.4	3.2	1.1	-	1.2	1.2	1.7	3.0
B1091	0.5-2'	-	-	1.3	2.1	2.8	1.8	3.5	-	-	-	1.5	3.2
	6-7'	-		40.	28.	20.	10.	4.4	-	9.8	6.2	7.8	10.
	18-19'	-	-	.20	.40	20.	10.	-	.40	-	-	.10	-

TABLE 5.7 (CONTINUED)
(ALL RESULTS IN MG/KG)

Boring Number	Depth	Acenaphthene	Acenaph-thylene	Diethyl phthalate	N-Nitroso-dimethylamine	Indeno(1,2,3-c,d)pyrene	bis(2-Ethyl-hexyl)phthalate	Di-n-butyl phlalate	Butylbenzyl phthalate	Benzo(a)-pyrene	Benzo(ghi)-perylene	Dibenzo(a,h)-anthracene	Dimethyl phthalate	Phenol
B1065	1-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	6-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
	11-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
B1066	1.5-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
B1067	1-2'	-	-	-	-	-	-	-	-	-	-	-	-	.10
	5.5-7'	-	-	.50	7.1	-	-	.20	.10	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-	-
B1068	1.5-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.5-16.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
B1090	0.5-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.5-15'	-	-	-	-	-	-	-	-	-	-	-	-	-
B1091	0.5-2'	-	-	-	-	-	-	-	-	3.2	-	-	-	-
	6-7'	3.9	.50	.10	-	4.4	-	.20	-	8.0	3.6	1.5	-	-
	18-19'	-	-	-	-	-	2.5	-	-	-	-	-	.20	-

Note: The locations of borings in this table may be found in Figure 5.11.

levels of volatiles and one isolated area of high PCBs in the SCL. Additionally, several SCL samples showed moderate levels of base/neutral compounds . The two borings adjacent to the NCL showed high levels of ethylbenzene and other non-priority pollutant volatiles. Low to moderate levels of PCBs and some base/neutrals were also present in these two borings.

Several Phase 2 boring locations in the SCL contained moderate to high levels of priority pollutant pesticide compounds. These compounds are found in the top two feet of these borings indicating that pesticide compounds were probably dumped or spilled on the ground surface after the lagoon was closed in 1974. None of these compounds were ever produced or used as raw materials at the plant.

Borings B1065, B1067, B1090, and B1091 were sampled for priority pollutant metals during Phase 2. Only the latter two borings exhibited concentrations of metallic elements which were outside the "typical" background range for soils (see Appendix R). Borings B1090 and B1091 exhibited elevated levels of mercury. From the data, it appears that the elevated mercury levels are confined to the body of the SCL as the borings just inside the fence do not show elevated metals levels.

An interview with a former employee of Berkeley Chemical/Millmaster Onyx (R. S. Dykes, personal interview, January, 1986) revealed that when the two chemical lagoons were taken out of service the liquid contents were pumped out and the bottoms and sides of the lagoons were excavated. Approximately one foot of soil was removed from the bottoms and sides of the lagoons. Visual evidence at the time of closure indicated that the soil on the bottoms and sides of the lagoons was stained or discolored only to a depth of approximately three to six inches into the surrounding material. Additionally, the interview revealed that some contaminated material may have been left at the north end of the NCL due to the inability of the equipment to reach it.

The above facts lead ES to conclude that the SCL is not a major source of contaminants on this site as borings in and around the SCL show little contaminant migration and records indicate that most of the contaminated material was removed from the lagoon and placed elsewhere. The body of the SCL is an area of concern due to the presence of high levels of PCBs (in one location) and moderate to high levels of pesticide compounds. The analytical results of samples from the borings adjacent to the SCL do not indicate that major contaminant migrations occurred from the SCL to the west, east, or south. The NCL does appear to be a source of contaminants based upon analytical results from borings adjacent to the west side of the NCL.

Chemical Lagoon Dredged Material Disposal Area (DMDA)

Interviews with former Millmaster Onyx employees revealed that material dredged from the North Chemical Lagoon during a 1960's cleaning was apparently buried behind and to the northwest of the shop and boiler room at the approximate location shown in Figure 5.1. The northwest corner of the plant site was also used for drum storage, before and after a concrete slab was placed over the area in the 1960's. That location coincides with the location of observation well 0-2 (constructed by ES, 1983). Sampling of this well has indicated contaminated groundwater exists in the shallow zone in this area. The results of this sampling are discussed in more detail in Chapter 6.

ES investigated the DMDA during Phase 2. Seven borings were performed in the vicinity of 0-2 and soil sampled for PCBs, organic chemicals and (in some cases) metals. All borings were completed to the top of the glacial lake deposits. The location of the Phase 2 borings in the DMDA is shown in Figure 5.9.

Table 5.8 lists the results of Phase 2 sampling from the DMDA. Examination reveals several samples with high levels of volatile and base/neutral compounds. Only low levels of PCBs are present in the samples from the DMDA. No elevated metals levels (above "typical" background values) were detected in the DMDA.

The high levels of volatile and base/neutral compounds present indicate that the DMDA is one of the major contaminant sources on the site.

Product Storage Area (PSA)

Aerial photos taken during the life of the plant indicate that at one time a tank storage area was located in the northeast portion of the site, as shown in Figure 5.1. Above ground tanks in this area were used to store solvents for use in the plant. The area was investigated because oily materials were observed to be seeping from that area through the river bank. It was assumed that products or raw materials may have leaked onto the ground in this area during material transfer to or from the tanks.

Three test pits were excavated in this area by ES during Phase 1 (see Figure 5.5) and samples of soil and water were collected and analyzed for the 126 priority pollutants. Weston also excavated one test pit in the area during Phase 1 but samples collected from this pit were only analyzed for PCBs. The PSA was thoroughly examined by ES during Phase 2. Fourteen test borings were completed in the PSA and soil samples collected for PCBs, organic chemicals and (in some cases) metals. Locations of Phase 2 soil borings may be found in Figure 5.10.

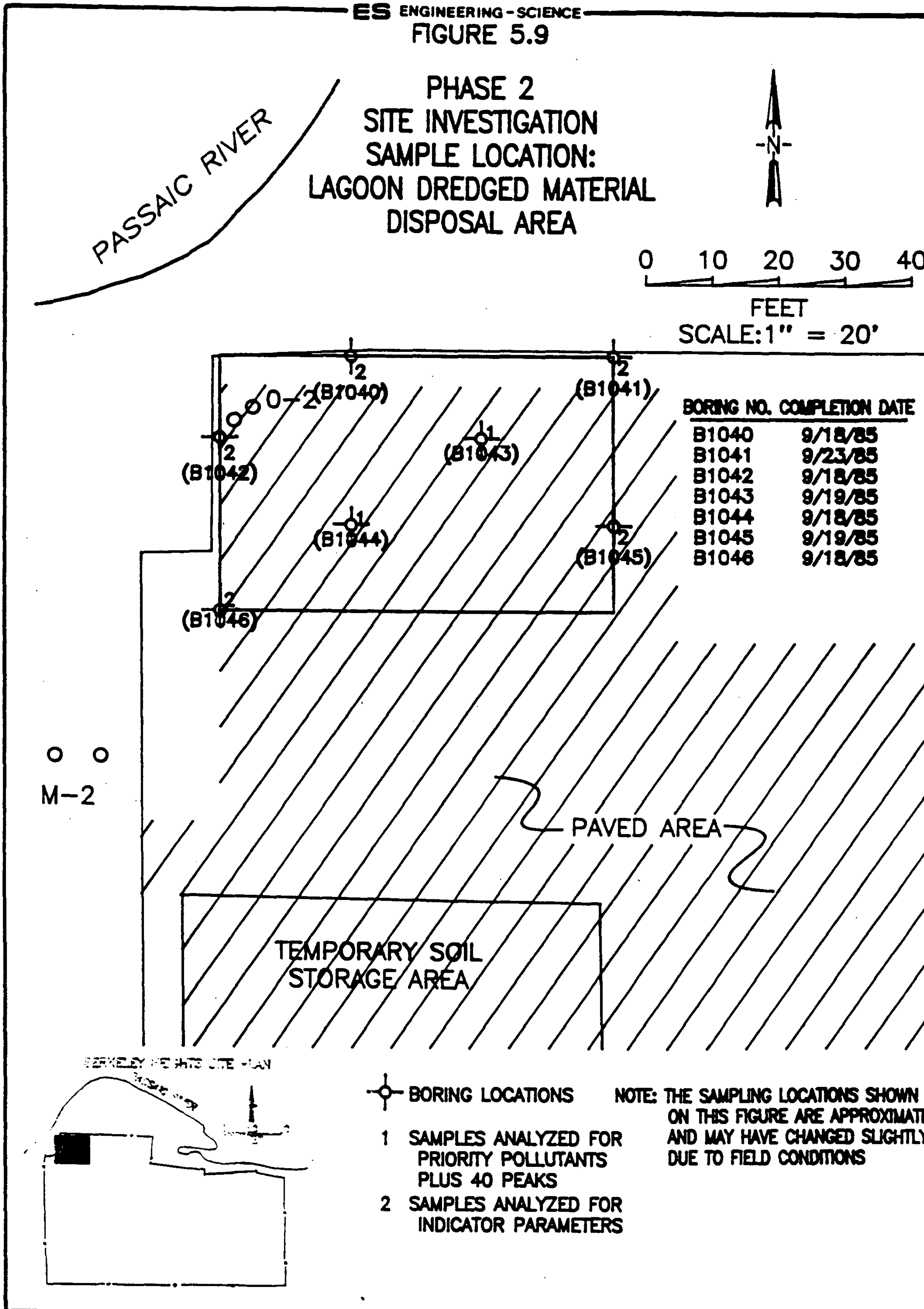
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FIGURE 5.9
PHASE 2
SITE INVESTIGATION
SAMPLE LOCATION:
LAGOON DREDGED MATERIAL
DISPOSAL AREA
PASSAIC RIVER
N
0 10 20 30 40
FEET
SCALE: 1" = 20'
O-2
(B1040)
(B1041)
(B1042)
(B1043)
(B1044)
(B1045)
(B1046)
M-2
PAVED AREA
TEMPORARY SOIL STORAGE AREA
BORING NO. COMPLETION DATE
B1040 9/18/85
B1041 9/23/85
B1042 9/18/85
B1043 9/19/85
B1044 9/18/85
B1045 9/19/85
B1046 9/18/85
BORING LOCATIONS
1 SAMPLES ANALYZED FOR PRIORITY POLLUTANTS PLUS 40 PEAKS
2 SAMPLES ANALYZED FOR INDICATOR PARAMETERS
NOTE: THE SAMPLING LOCATIONS SHOWN ON THIS FIGURE ARE APPROXIMATE AND MAY HAVE CHANGED SLIGHTLY DUE TO FIELD CONDITIONS

TABLE 5.8

RESULTS OF PHASE 2 DREDGED MATERIAL DISPOSAL AREA SAMPLING (ALL RESULTS IN MG/KG)

Boring Number	Depth	Chloro-benzene	Ethyl-benzene	Methylene chloride	1,1,2,2-Tetra-chloroethane	Toluene	Xylene	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel
B 1040	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	4.9	150.	-	-	8.2	-	-	-	-	-	-	-	-	-
	15-17'	0.02	.05	-	-	-	-	-	-	-	-	-	-	-	-
B 1041	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7-9'	-	-	-	-	.23	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	.10	-	-	-	-	-	-	-	-	-
B 1042	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	1.3	25.	-	-	1.2	-	-	-	-	-	-	-	-	-
	15-17'	11.	190.	-	-	9.1	-	-	-	-	-	-	-	-	-
B 1043	0.5-2'	-	-	-	-	-	-	1.6	.9	-	23.	21.	51.	-	23.
	5.5-7'	0.09	1.5	.18	.02	.13	7.6	2.5	1.1	-	32.	22.	57.	-	26.
	15-17'	0.12	.06	-	-	-	.96	1.2	1.0	-	39.	14.	55.	-	23.
B 1044	0-2'	-	-	-	-	-	-	-	.9	-	21.	44.	48.	.2	19.
	5-7'	16.	210.	190.	-	1.4	1300.	1.8	1.1	-	32.	4.	71.	.2	23.
	15-17'	5.7	81.	-	-	3.5	380.	2.4	1.3	4.0	35.	24.	62.	-	32.
B 1045	1-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-6.5'	-	250.	-	-	25.	-	-	-	-	-	-	-	-	-
	10.5-12'	-	280.	-	-	29.	-	-	-	-	-	-	-	-	-
	15-16'	-	14.0	-	-	1.5	-	-	-	-	-	-	-	-	-
	20.5-22'	-	.84	-	-	.07	-	-	-	-	-	-	-	-	-
B 1046	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	.11	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	1.4	33.	-	-	.87	-	-	-	-	-	-	-	-	-

TABLE 5.8, CONTINUED

Boring Number	Depth	Thallium	Zinc	Phenolics, Total	PCB	Acenaphthene	Anthracene	Benzo(a)-anthracene	Benzo(a)-pyrene	Benzo(b)-fluoranthene, Benzo(k)-fluoranthene	bis(2-Ethylhexyl)-phthalate	Chrysene	1,2-Dichloro-benzene	Fluoranthene	Fluorene
B 1040	0-2'	-	-	1.1	.29	-	-	.10	-	.20	23.0	.10	-	.30	-
	5-6'	-	-	.6	3.6	-	-	.40	.30	.40	1.3	.40	.30	.80	-
	15-17'	-	-	.6	-	-	-	-	-	-	-	-	-	-	-
B 1041	0-2'	-	-	.4	.05	-	-	.20	.20	.30	-	.20	-	.50	-
	7-9'	-	-	.3	.06	-	-	-	-	-	1.1	-	-	-	-
	10-12'	-	-	.3	-	-	-	-	-	-	-	-	-	-	-
B 1042	0-2'	-	-	.2	.17	-	-	.30	.30	.40	-	.30	.30	.80	-
	5-7'	-	-	.6	.13	-	-	60.	50.	70.	-	60.	.10	160.	-
	15-17'	-	-	1.0	.05	-	-	-	-	-	-	-	.30	-	-
B 1043	0.5-2'	.12	121.	.6	-	-	-	-	-	-	-	-	-	-	-
	5.5-7'	.07	84.	.3	-	-	-	-	-	-	1.2	-	-	-	-
	15-17'	.12	265.	-	-	-	-	-	-	-	-	-	-	-	-
B1044	0-2'	.07	141.	.9	.14	-	.10	.60	.40	.50	-	.30	-	.90	-
	5-7'	.14	106.	2.3	.12	.10	.20	.30	.20	.30	-	.20	.30	.60	.10
	15-17'	.09	106.	.4	.40	-	-	-	-	-	2.0	-	.30	-	-
B 1045	1-2'	-	-	.5	.07	-	-	.50	.40	.50	-	.40	-	.90	-
	5-6.5'	-	-	79.	.13	-	-	-	-	-	5.4	-	-	-	-
	10.5-12'	-	-	9.0	-	-	-	-	-	-	2.5	-	-	.10	-
	15-16'	-	-	3.6	.42	-	-	.20	.30	.40	1.4	.20	-	.30	-
	20.5-22'	-	-	.6	.49	-	-	-	-	-	-	-	-	-	-
B 1046	0-2'	-	-	.3	.18	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	.4	1.0	-	-	.70	.70	1.3	1.6	.70	-	2.3	-
	10-12'	-	-	.5	-	-	-	-	-	-	-	-	-	-	-

TABLE 5.8, CONTINUED

Boring Number	Depth	Indeno-(1,2,3-c,d)-pyrene	Naphthalene	Phenanthrene	Pyrene	Di-n-butyl-phthalate	Phenol
B 1040	0-2'	-	-	.40	.20	-	-
	5-7'	-	-	.90	.90	-	-
	15-17'	-	-	-	-	-	-
B 1041	0-2'	-	-	.60	.30	-	-
	7-9'	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-
B 1042	0-2'	-	-	.70	.50	-	-
	5-7'	-	-	150.	120.	-	-
	15-17'	-	-	-	-	-	-
B 1043	0.5-2'	-	-	-	-	-	-
	5.5-7'	-	-	-	-	.30	-
	15-17'	-	-	-	-	-	-
B 1044	0-2'	.30	.20	.60	.70	-	-
	5-7'	-	.40	.80	.60	-	.20
	15-17'	-	.10	-	-	-	-
B 1045	1-2'	-	-	.70	.80	-	-
	5-6.5'	-	-	.20	-	-	-
	10.5-12'	-	-	.20	.10	-	-
	15.16'	-	-	.20	.20	-	-
	20.5-22'	-	-	-	-	-	-
B 1046	0-2'	-	-	-	-	-	-
	5-7'	-	-	2.3	1.1	-	-
	10-12'	-	-	-	-	-	-

Note: Locations of borings shown in Figure 5.9.

Only compounds which were detected in one or more samples are shown.

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FIGURE 5.10

PHASE 2 SITE INVESTIGATION SAMPLE LOCATION: PRODUCT STORAGE AREA

BORING NO.	COMPLETION DATE
B1000	9/05/85
B1001	9/11/85
B1002	9/09/85
B1003	9/09/85
B1004	9/09/85
B1005	9/06/85
B1006	9/11/85
B1007	9/05/85
B1008	9/06/85
B1009	9/09/85
B1010	9/11/85
B1103	9/23/85
B1104	9/18/85
B1105	9/18/85

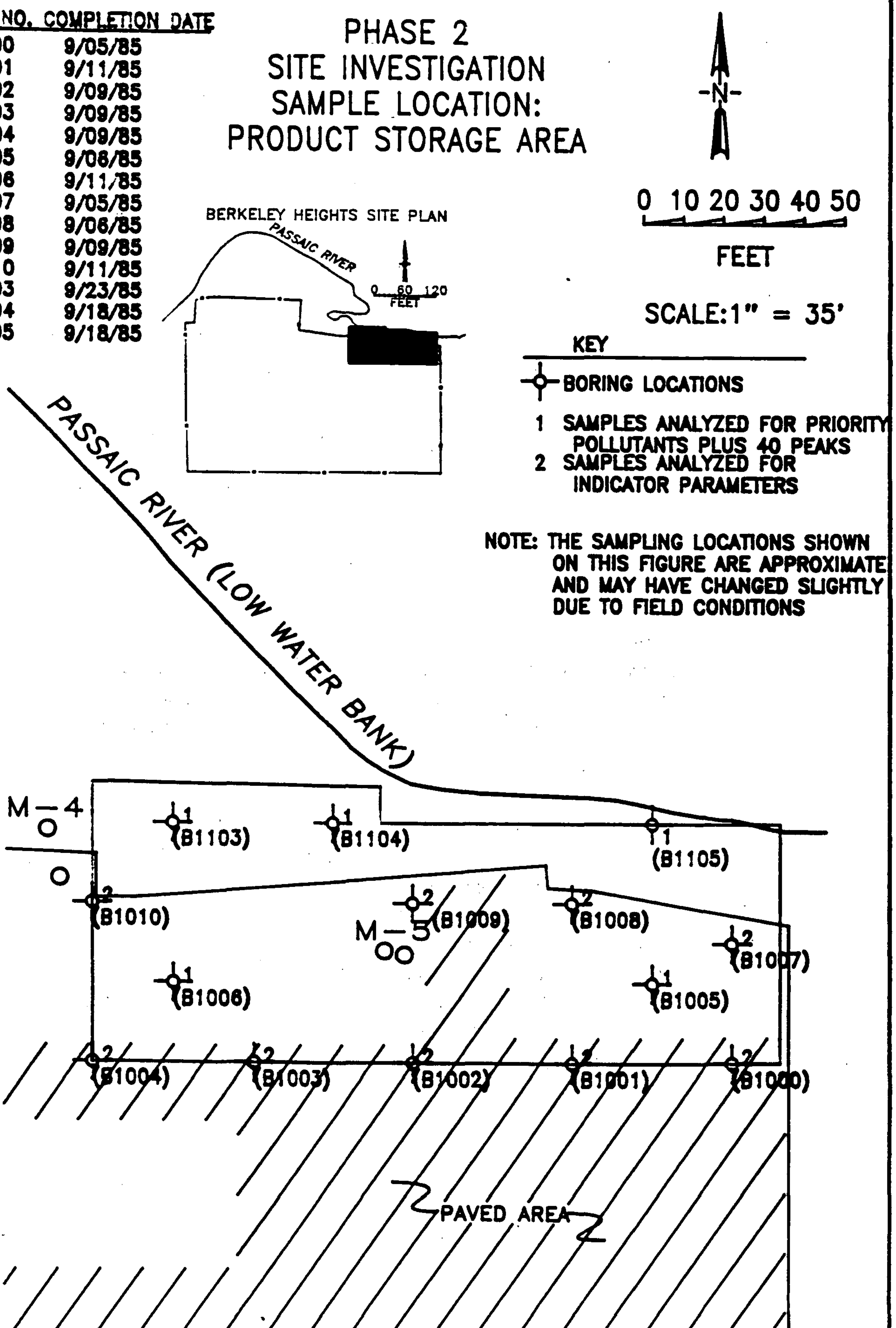

Table 5.9 lists the results of Phase 1 sampling in the PSA. Examination indicates moderate to high levels of volatile compounds and moderate levels of base/neutrals. No PCBs were detected in ES Phase 1 PSA sampling although Weston's sample from TP-15 yielded moderate levels of PCBs. Table 5.10 contains the results of Phase 2 sampling in the PSA. Examination of this table indicates moderate to high levels of volatile compounds, and moderate levels of base/neutrals and PCBs. The highest concentrations of all parameters are in those samples adjacent to the CWL in the western portion of the PSA. Only low levels of contaminants were found in one boring adjacent to the Passaic River. There are no elevated metals concentrations in borings from the PSA.

The above results lead to the conclusion that the PSA is a source of contamination. The seeps along the river bank may be due to high groundwater levels forcing contaminants along the bedding of old storm drain lines (which are known to have crossed the PSA) and through the embankment along the Passaic. The impact of these seeps on the Passaic River is examined in a subsequent section of this chapter and in the executive summary.

CONTAMINATION IN OTHER AREAS

During both Phase 1 and Phase 2, detailed investigations were conducted to determine the extent of contamination both on and off the plant site in areas not specifically identified as contamination sources. The sections below describing these Phase 1 and Phase 2 efforts have been divided geographically into those efforts conducted on-site and those conducted off-site.

On-Site Areas

The Phase 1 investigation of on-site areas not identified as contamination sources was conducted by Weston in October, 1982. Sampling was conducted of surface and near-surface soils and analysis for PCBs was performed on the samples. Weston collected both grab samples at specific points (from the ground surface or from test pits) and surface composite samples from a grid laid out over the entire plant site. Most of Weston's sample locations are shown in Figure 5.5 and 5.15. ES collected additional PCB surface soil samples on-site during Phase 1 as part of an experimental incinerator test burn of site soils. The test burn was conducted in May of 1985. ES collected a large amount of soils from various areas on-site and sampled these soils for PCBs. The results are shown in a figure in the section entitled "SUMMARY OF PHASE 1 AND PHASE 2 SAMPLE RESULTS" later in this chapter. During Phase 2, ES investigated on-site areas not identified as sources. A 50 by 50 foot grid was established on the plant site coincident with the south and west plant fences. Borings were conducted at alternating nodes on this grid. Figure

TABLE 5.9

PHASE 1 PRODUCT STORAGE AREA ANALYTICAL DATA (ALL VALUES IN MG/KG OR MG/L, AS APPLICABLE)

Sampling Point/Parameter	NPDES Number	Concentration
North Pit #1 - Soil		
Ethylbenzene	19V	1.2
Methylene chloride	22V	0.5
Toluene	25V	0.2
Benzo(b)fluoranthene	7B	0.7[1]
Benzo(k)fluoranthene	9B	0.7[1]
bis(2-Ethylhexyl)phthalate	13B	0.4
Chrysene	18B	0.5
Fluoranthene	31B	0.6
Phenanthrene	44B	0.6
Pyrene	45B	0.7
Phenolics, total	15M	0.1
North pit #2 - Soil		
Chlorobenzene	7V	2.6
Ethylbenzene	19V	6.2
Toluene	25V	0.5
Benzo(a)anthracene	5B	4.9
Benzo(a)pyrene	6B	4.5
Benzo(b)fluoranthene	7B	11.8[1]
Benzo(k)fluoranthene	9B	11.8[1]
bis(2-Ethylhexyl)phthalate	13B	51.7
Chrysene	18B	8.8
Fluoranthene	31B	10.3
Phenanthrene	44B	10.4
Pyrene	45B	11.9
Phenolics, total	15M	0.7
North Pit #2 - Liquid		
Chlorobenzene	7V	4.27
Ethylbenzene	19V	152.00
Methylene chloride	22V	0.51
Toluene	25V	0.71
1,2-Dichlorobenzene	20B	0.01
1,3-Dichlorobenzene	21B	0.01
1,4-Dichlorobenzene	22B	0.13
Arsenic	2M	0.013
Copper	6M	0.045
Lead	7M	0.060
Zinc	13M	0.065
Phenolics, total	15M	0.20

TABLE 5.9, CONTINUED

Sampling Point/Parameter	NPDES Number	Concentration
<u>North Pit #3 - Soil</u>		
Benzene	3V	2.4
Chlorobenzene	7V	1.6
1,2-Dichloroethane	15V	1.3
Ethylbenzene	19V	47.5
Methylene chloride	22V	0.7
Toluene	25V	34.1
Phenolics, total	15M	1.7
<u>North Pit #3 - Liquid</u>		
Chlorobenzene	7V	2.46
Chloroform	11V	1.08
Ethylbenzene	19V	30.90
Toluene	25V	4.36
Phenol	10A	0.25
1,2-Dichlorobenzene	20B	0.89
Arsenic	2M	.01
Cadmium	4M	0.01
Chromium	5M	0.12
Copper	6M	0.14
Lead	7M	0.10
Mercury	8M	<0.01
Nickel	9M	0.02
Zinc	13M	0.2
Phenolics, total	15M	1.5

1 Reported as isometric pair.

Note: Sampling locations may be found in Figure 5.5. Only compounds which were detected are reported.

TABLE 5.10
RESULTS OF PHASE 2 PRODUCE STORAGE AREA SAMPLING
(ALL RESULTS IN MG/KG)

Boring Number	Depth	Benzene	Chloro-benzene	Ethyl-benzene	Toluene	Xylene	Methyl isobutyl ketone	Acetone	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead
B 1000	0.6-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.8-12'	-	.22	-	-	-	-	-	-	-	-	-	-	-
B 1001	0.5-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	5.2	17.0	-	-	-	-	-	-	-	-	-	-
	10-11.5'	-	1.2	12.0	-	-	-	-	-	-	-	-	-	-
B 1002	1-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1003	1-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1004	0.5-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	6-8'	-	-	72.0	-	-	-	-	-	-	-	-	-	-
B 1005	1-2'	-	.07	-	-	-	.32	-	1.4	.60	-	17.	31.	75.
	5-6'	-	.04	-	-	-	-	-	1.6	.50	-	12.	17.	28.
	10-11'	-	.13	-	-	-	-	3.5	3.9	.90	-	23.	30.	40.
B 1006	1-2'	-	-	-	-	-	-	-	.10	.72	-	19.	63.	13.
	6-9'	-	-	120.0	6.6	850.0	-	-	1.9	.85	-	19.	27.	44.
B 1007	1-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	8-9'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1008	1-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	9.5-11.5'	-	.03	.51	-	-	-	-	-	-	-	-	-	-
B 1009	5-7'	-	-	7.2	-	-	-	-	-	-	-	-	-	-
	10-11.5'	-	-	13.0	.54	-	-	-	-	-	-	-	-	-
	12.5-13.5'	-	-	.38	-	-	-	-	-	-	-	-	-	-
B 1010	0.5-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	16.0	1.1	-	-	-	-	-	-	-	-	-
	10-12'	-	-	.55	.03	-	-	-	-	-	-	-	-	-
B 1103	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-4'	.03	-	.24	-	1.3	-	-	-	-	-	-	-	-
B 1104	0-2'	-	-	-	-	-	-	-	1.9	1.0	-	22.	21.	47.
	2-4'	-	-	-	-	-	-	-	1.9	1.3	3.0	47.	28.	71.
B 1105	0-2'	-	-	-	-	-	-	-	1.2	.70	-	41.	20.	43.

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TABLE 5.10, CONTINUED

Boring Number	Depth	Mercury	Nickel	Selenium	Thallium	Zinc	Phenolics, total	PCB	Benzo(a)-anthracene	Benzo(b)-fluroanthene, Benzo(k)-fluoranthene	Benzo(a)-pyrene	Chrysene	1,2-Dichloro-benzene	Diethyl phthalate
B 1000	0.6-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-6.5'	-	-	-	-	-	1.5	-	-	-	-	-	-	-
	10.8-12'	-	-	-	-	-	1.7	-	-	-	-	-	-	-
B 1001	0.5-2'	-	-	-	-	-	-	2.5	1.5	-	-	-	-	-
	5-7'	-	-	-	-	-	-	-	-	-	-	-	.53	-
	10-11.5'	-	-	-	-	-	.50	-	-	-	-	-	-	-
B 1002	1-2'	-	-	-	-	-	1.0	2.5	8.5	-	-	-	22.0	-
	5-6.5'	-	-	-	-	-	.30	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	.30	-	-	-	-	-	-	-
B 1003	1-2'	-	-	-	-	-	.20	.93	-	-	-	-	-	-
	5-6.5'	-	-	-	-	-	.30	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	.20	-	-	-	-	-	-	-
B 1004	0.5-2'	-	-	-	-	-	.20	.34	-	-	-	-	-	-
	6-8'	-	-	-	-	-	.30	-	-	-	-	-	-	-
B 1005	1-2'	.6	.6	.1	-	83.	.56	6.2	-	-	-	-	-	-
	5-6'	-	15.	-	-	37.	.58	-	-	-	-	-	-	-
	10-11'	-	23.	-	.14	67.	.64	-	-	-	-	-	-	-
B 1006	1-2'	.8	22.	-	.07	100.	-	52.0	-	-	-	-	-	-
	6-9'	-	25.	-	.09	.60	.20	-	-	-	-	-	-	-
B 1007	1-2'	-	-	-	-	-	.57	.31	-	-	-	-	-	-
	8-9'	-	-	-	-	-	.83	-	-	-	-	-	-	-
B 1008	1-2'	-	-	-	-	-	.61	1.5	1.7	-	-	-	-	-
	9.5-11.5'	-	-	-	-	-	.45	.06	-	-	-	-	-	-
B 1009	5-7'	-	-	-	-	-	.40	3.9	-	-	-	-	-	-
	10-11.5'	-	-	-	-	-	1.2	.44	-	-	-	-	-	-
	12.5-13.5'	-	-	-	-	-	.50	-	-	-	-	-	-	-
B 1010	0.5-2'	-	-	-	-	-	.50	1.0	26.0	40.0	15.0	19.0	-	-
	5-7'	-	-	-	-	-	2.3	30.6	3.0	3.0	-	2.5	-	-
	10-12'	-	-	-	-	-	2.1	.94	.12	-	-	-	-	-
B 1103	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-4'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1104	0-2'	-	20.	-	.08	219.	-	.27	-	.50	-	.20	-	.80
	2-4'	-	32.	-	.10	91.	-	-	-	-	-	-	-	-
B 1105	0-2'	-	24.	-	.07	165.	.30	.34	-	-	-	-	-	-

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TABLE 5.10, CONTINUED

Boring Number	Depth	Fluoranthene	Indeno-(1,2,3-c,d)-pyrene	Phenanthrene	Pyrene	bis(2-Ethylhexyl) phthalate	Di-n-butyl phthalate
B 1000	0.6-2'	-	-	-	-	-	-
	5-6.5'	-	-	-	-	-	-
	10.8-12'	-	-	-	-	-	-
B 1001	0.5-2'	-	-	1.3	3.0	-	-
	5-7'	-	-	-	.11	-	-
	10-11.5'	-	-	-	-	-	-
B 1002	1-2'	5.3	-	-	11.0	-	-
	5-6.5'	-	-	-	-	-	-
	10-12'	-	-	-	-	1.5	-
B 1003	1-2'	-	-	-	-	-	
	5-6.5'	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-
B 1004	0.5-2'	-	-	-	-	-	-
	6-8'	-	-	-	-	-	-
B 1005	1-2'	-	-	-	.12	-	-
	5-6'	-	-	-	-	-	-
	10-11'	-	-	-	-	-	-
B 1006	1-2'	-	-	-	-	-	-
	6-9'	-	-	-	-	-	-
B 1007	1-2'	-	-	-	-	-	-
	8-9'	-	-	-	-	-	-
B 1008	1-2'	-	-	-	-	-	-
	9.5-11.5'	-	-	-	-	-	-
B 1009	5-7'	-	-	-	-	-	-
	10-11.5'	-	-	-	-	-	-
	12.5-13.5'	-	-	-	-	-	-
B 1010	0.5-2'	57.0	-	71.0	51.0	-	-
	5-7'	4.2	-	4.2	4.2	-	-
	10-12'	.10	-	.24	-	-	-
B 1103	0-2'	-	-	-	-	-	.60
	2-4'	-	-	-	-	1.3	-
B 1104	0-2'	-	.40	-	-	-	-
	2-4'	-	-	-	-	-	-
B 1105	0-2'	-	-	-	-	-	-

Note: Locations of borings shown in Figure 5.10.
Only compounds which were detected in one or more samples are shown.

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5.11 shows the grid and sampled nodes for both on-site and off-site areas. Borings were completed to the top of the glacial lake deposits. Samples of soil were collected at various depths from each boring and analyzed for PCBs, organic chemicals and (in some cases) metals.

Table 5.11 lists the results of Weston's Phase 1 on-site sampling. Examination of this table reveals high levels of PCBs in the surface soils in the southeast corner of the site (see Figure 5.1) and other isolated locations. The high levels of PCBs are primarily restricted to the upper 18 inches of soil as the oil in which the PCBs are suspended is sorbed readily onto soil particles. Table 5.12 lists the analytical results of ES Phase 2 on-site sampling program. Examination of this table reveals that contamination in areas on-site not associated with sources occurs only in isolated locations and at low to moderate levels.

Boring B1102 was placed through the slab of former Building No. 5 to determine whether PCBs had migrated under existing slabs after the 1967 rupture and spill. This particular boring shows trace PCB contamination (less than 1 ppm), no base neutral contamination and only low levels of volatiles. It can thus be concluded that PCBs have not migrated under slabs which existed at the time of the 1967 fire.

The results of both the Phase 1 and Phase 2 investigation in on-site areas leads to the conclusion that contamination on the site is almost exclusively limited to the areas in and adjacent to contaminant sources and where contamination does exist on the site it is at low to moderate levels.

Off-Site Areas

Areas in the immediate vicinity of the plant site were investigated by ES both during Phase 1 and Phase 2. Weston conducted minor investigations off-site for PCBs during Phase 1. The ES Phase 1 investigation off-site incorporated previously-gathered Weston PCB data. ES collected soil samples for both PCB and indicator volatile analyses. The indicator volatiles used during Phase 1 were ethylbenzene and chlorobenzene. Core samples from zero to five feet below grade were collected for ethyl- and chlorobenzene analysis at various locations off-site. Figure 5.5 shows the locations of these ES core samples. Core samples C5 through C9 were collected at "seeps" along the Passaic River bank adjacent to the CWL and the PSA. The PCB sampling which ES conducted off-site during Phase 1 was in conjunction with cleanup operations designed to remove PCB contaminated off-site soil and move it back inside the site's protective fence/berms. Four major areas of PCB-contaminated surface soils were identified by ES during Phase 1. These four areas are shown in Figure 5.12. During the autumn of 1983 and the summer of 1985 these soils were excavated, moved inside the plant fence and placed in the Temporary Soils Storage Area.

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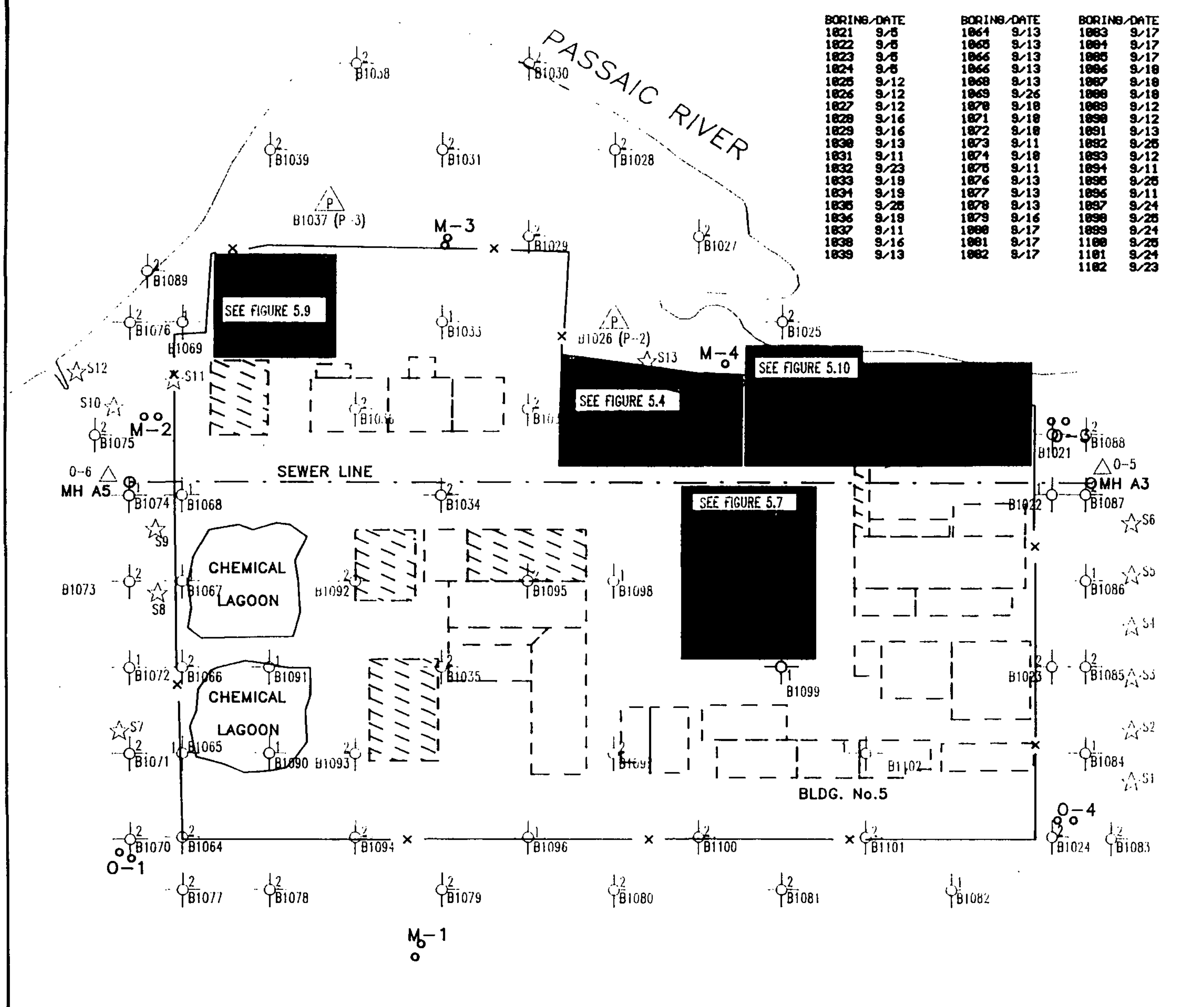
FIGURE 5.11

PHASE 2 SITE INVESTIGATION SAMPLE LOCATIONS: ON-SITE AND OFF SITE AREAS



BORING/DATE		BORING/DATE		BORING/DATE	
1021	9/5	1064	9/13	1083	9/17
1022	9/5	1065	9/13	1084	9/17
1023	9/5	1066	9/13	1085	9/17
1024	9/5	1066	9/13	1086	9/10
1025	9/12	1068	9/13	1087	9/10
1026	9/12	1069	9/26	1088	9/10
1027	9/12	1070	9/10	1089	9/12
1028	9/16	1071	9/10	1090	9/12
1029	9/16	1072	9/10	1091	9/13
1030	9/13	1073	9/11	1092	9/25
1031	9/11	1074	9/10	1093	9/12
1032	9/23	1075	9/11	1094	9/11
1033	9/19	1076	9/13	1095	9/25
1034	9/19	1077	9/13	1096	9/11
1035	9/25	1078	9/13	1097	9/24
1036	9/19	1079	9/16	1098	9/25
1037	9/11	1080	9/17	1099	9/24
1038	9/16	1081	9/17	1100	9/25
1039	9/13	1082	9/17	1101	9/24
				1102	9/23

LEGEND

- -BORING LOCATIONS
- 1 -SAMPLES ANALYZED FOR PRIORITY POLLUTANTS PLUS 40 PEAKS
- 2 -SAMPLES ANALYZED FOR INDICATOR PARAMETERS
- P -PIEZOMETER
- -OFFSITE OBSERVATION WELL
- -PCB SURFACE SAMPLING LOCATIONS
- -SLABS OF BUILDINGS BUILT AFTER THE 1967 FIRE

NOTE: THE SAMPLING LOCATIONS SHOWN ON THIS FIGURE ARE APPROXIMATE AND MAY HAVE CHANGED SLIGHTLY DUE TO FIELD CONDITIONS

-N-

0 60 120

FEET

SCALE:1" = 60'

TABLE 5.11
PHASE 1 ON-SITE PCB ANALYSES
(WESTON, OCT., 1982)
(ALL RESULTS IN MG/KG)

Sample Location	Sample Depth (inches)	PCB Concentration	Comments	Sample Location	Sample Depth (inches)	PCB Concentration	Comments
S-1	0-1	1190.		TP-15	0-6	<5.0	Sample # S-53
S-2*	0-1	27.2	Area A composite	TP-15	6-12	11.2	Sample # S-54
S-3*	0-1	20.1	Area B composite	TP-15	12-18	9.1	Sample # S-55
S-4*	0-1	22.2	Area C composite	S-56	0-1	47.4	
S-6*	0-1	119.	Area D composite	SA-2	0-1	14.9	
S-7*	0-1	92.2	Area E composite	SA-17*	-	49.6	Area J composite
S-8*	0-1	94.8	Area F composite	SA-18*	-	26.9	Area K composite
S-9*	0-1	912.	Area G composite	SA-19*	-	5.1	Area L composite
S-10*	0-1	292.	Area H composite	SA-20*	-	<5.0	Area M composite
S-11*	0-1	213.	Area I composite	SA-21*	-	36.8	Area N composite
S-12	0-1	17.8		SA-23*	-	<5.0	Area P composite
S-13	0-1	2060.		SA-24*	-	23.0	Area Q composite
S-14	0-1	126.		SA-25	-	30.4	Area U composite
S-15	0-1	648.		SA-26*	-	61.8	Area R composite
S-16	0-1	1510.		SA-27*	-	8.1	Area S composite
S-17	0-1	163.		SA-28*	-	54.0	Area T composite
S-18**	0-1	5.1	Immediately adjacent to S-1	TP-A	10	4.2	Sample # SA-35
S-19	0-1	8.9		TP-A	20	<5.0	Sample # SA-36
S-21	0-1	36.2		TP-B	10	<5.0	Sample # SA-37
TP-1	13-16	3740.	Sample #S-22	TP-B	24	119.6	Sample # SA-38
TP-1	16-24	6.6	Sample #S-23	TP-C	15	<5.0	Sample # SA-39
TP-2	0-20	<5.0	Sample #S-24	TP-C	20	<5.0	Sample # SA-40
TP-2	20	24.8	Sample # S-25	TP-D	10	<5.0	Sample # SA-41
TP-3	6	2810.	Sample # S-26	TP-D	24	<5.0	Sample # SA-42
TP-3	12-15	<5.0	Sample # S-27	TP-E	20-25	<5.0	Sample # SA-43
TP-4	6-10	232.	Sample # S-28	TP-F	12	<5.0	Sample # SA-45
TP-4	14-17	<5.0	Sample # S-29	TP-F	30	<5.0	Sample # SA-46
TP-5	3-6	1040.	Sample # S-30	TP-G	12	<5.0	Sample # SA-47
TP-5	10-12	18.3	Sample # S-32	TP-G	24	<5.0	Sample # SA-48
TP-6	4-6	71.1	Sample # S-34	TP-H	24	125.9	Sample # SA-49A
TP-6	10-12	<5.0	Sample # S-35	TP-H	40	2260.	Sample # SA-50A
TP-7	6-8	60.	Sample # S-36	TP-I	18	<5.0	Sample # SA-51
TP-7	10-12	11.8	Sample # S-37	TP-I	40	<5.0	Sample # SA-52
TP-8	14-18	<5.0	Sample # S-38	TP-J	10	6.7	Sample # SA-53
TP-9	4-8	17.8	Sample # S-39	TP-J	20	<5.0	Sample #SA-54
TP-9	10-12	<5.0	Sample # S-40	TP-K	12	526.	Sample #SA-55
TP-10	12-15	<5.0	Sample # S-41	TP-K	30	<5.0	Sample # SA-56
TP-11	4-8	187.	Sample # S-43	TP-L	18	14.4	Sample # SA-57A
TP-11	12-15	<5.0	Sample # S-44	TP-L	34	<5.0	Sample # SA-58
TP-12	6-10	307.	Sample # S-45	SA-22*	-	30.6	Area O composite
TP-12	10-15	<5.0	Sample # S-46				

* These composite samples may be found on Figure 5.15. Other samples not marked with (*) may be found on Figure 5.5.
** Not shown on any figure. See Figure 5.5 for location of sample S-1 which is immediately adjacent to S-18.

TABLE 5.12

RESULTS OF PHASE 2 SITE PROPER SAMPLING
(ALL RESULTS IN MG/KG)

Boring Number	Depth	Chlorobenzene	Acetone	Methylene chloride	Xylene	Chloroform	Ethylbenzene	Toluene	Methyl isobutyl ketone	Benzene	Arsenic	Beryllium	Chromium
B 1021	1.5-2'	-	-	-	-	-	-	-	-	-	-	-	-
	10.5-11.5'	-	-	-	-	-	-	-	-	-	-	-	-
B 1022	1.5-2'	.02	11.0	-	-	-	-	-	-	-	1.2	0.5	14.
	8-9'	.09	2.4	-	-	-	-	-	-	-	1.1	0.8	25.
B 1023	1-2'	-	-	-	-	-	-	-	-	-	-	-	-
	6-7'	-	-	-	-	-	-	-	-	-	-	-	-
B 1024	1-2'	-	-	-	-	-	-	-	-	-	-	-	-
	6-7'	-	-	-	-	-	-	-	-	-	-	-	-
B 1025	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4.5-6'	-	-	-	-	-	-	-	-	-	-	-	-
	9.5-11.5'	-	-	-	-	-	-	-	-	-	-	-	-
B 1026	0-2'	-	-	-	-	-	-	-	-	-	1.8	1.0	24.
	4-6'	-	-	-	-	-	-	-	-	-	1.8	1.0	24.
	10-12'	-	1.1	.13	.09	-	-	-	-	-	2.6	1.6	51.
B 1027	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-
	9.5-11.5'	-	-	-	-	-	-	-	-	-	-	-	-
B 1028	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	.32	.07	.02	-	-	-	-	-	-	-

MAC/SY027/00033

TABLE 5.12, CONTINUED

Boring Number	Depth	Chlorobenzene	Acetone	Methylene chloride	Xylene	Chloroform	Ethylbenzene	Toluene	Methyl isobutyl ketone	Benzene	Arsenic	Beryllium	Chromium
B 1029	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-
B 1030	4.5-6.5'	-	-	-	-	-	.50	.07	-	-	-	-	-
	9-11'	-	-	-	-	-	.14	.03	-	-	-	-	-
B 1031	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-
B 1032	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	-	-	-	-	-	-	-	-	-	-
	10-11'	-	-	-	-	-	-	-	-	-	-	-	-
B 1033	0.5-1.5'	-	-	-	-	-	-	-	-	-	1.1	.4	7.
	10-12'	-	-	-	1.4	-	.23	-	-	-	1.4	1.0	24.
	13-14'	-	-	-	-	-	-	-	-	-	1.8	0.9	26.
B 1034	5-6.5'	.82	-	-	-	-	14.0	-	-	-	-	-	-
	10-11'	1.0	-	-	-	-	1.6	.03	-	-	-	-	-
B 1035	0-2'	-	-	-	-	-	-	-	-	-	-	-	
	5-7'	-	-	-	-	-	-	-	-	-	-	-	-
B 1036	1.5-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-
	10.5-12'	-	-	-	-	-	-	-	-	-	-	-	-
B 1037	0-2'	-	-	-	-	-	-	-	-	-	1.3	.82	23.
	4-8'	-	-	-	-	-	-	-	-	-	0.9	0.65	19.
	8-14'	-	-	-	-	-	-	-	-	-	1.0	0.65	13.

TABLE 5.12, CONTINUED

Boring Number	Depth	Chlorobenzene	Acetone	Methylene chloride	Xylene	Chloroform	Ethylbenzene	Toluene	Methyl isobutyl ketone	Benzene	Arsenic	Beryllium	Chromium
B 1038	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	9.5-11.5'	-	-	-	-	-	-	-	-	-	-	-	-
B 1039	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4.5-6.5'	-	-	-	-	-	.07	-	-	-	-	-	-
	9-11'	-	-	-	-	-	.28	.04	-	-	-	-	-
B 1064	1-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5-6'	-	-	-	-	-	-	-	-	-	-	-	-
B 1069	8-10'	-	-	-	-	-	-	-	-	-	-	-	-
	14-16'	.29	-	-	20.0	-	3.5	-	-	-	-	-	-
B 1089	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	.20	-	-	-	-	.16	-	-	-	-	-	-
B 1092	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	.22	-	-	-	-	.08	-	-	-	-	-	-
B 1093	1.5-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5-6.5'	-	-	-	-	-	.06	-	-	-	-	-	-
B 1094	1-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5-6'	-	-	-	-	-	.45	-	-	-	-	-	-
B 1095	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	-	-	-	-	-	-	-	-	-	-
B 1096	0.5-1.5'	-	-	-	-	-	-	-	-	-	0.2	0.67	17.
	5.5-6.5'	-	-	-	-	-	-	-	-	-	0.2	0.80	19.

TABLE 5.12, CONTINUED

Boring Number	Depth	Chlorobenzene	Acetone	Methylene chloride	Xylene	Chloroform	Ethylbenzene	Toluene	Methyl isobutyl ketone	Benzene	Arsenic	Beryllium	Chromium
B 1097	0.5-2.5'	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	4.2	.05	-	-	-	-	-
	9-11'	-	-	-	-	-	.07	-	-	-	-	-	-
B 1098	0-2'	-	-	-	-	-	-	-	-	-	3.7	0.7	21.
	8-9'	-	-	-	-	-	-	-	-	-	1.1	1.1	3.
B 1099	1-3'	-	-	-	-	-	-	-	-	-	2.0	0.4	12.
	4-6'	-	.45	-	15.0	-	1.7	2.2	-	.03	0.6	1.0	25.
	9-11'	.09	-	-	.93	-	.16	.09	.24	-	1.5	0.8	24.
	14-16'	-	-	-	.15	-	-	.02	-	-	1.6	1.5	38.
B 1100	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-
B 1101	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-
B 1102	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	.17	.06	-	-	-	-	-	-	-	-
	9-11'	-	-	.18	.14	-	-	-	-	-	-	-	-

TABLE 5.12, CONTINUED

Boring Number	Depth	Copper	Lead	Zinc	Nickel	Mercury	Thallium	Cyanide, total	Phenolics, total	Selenium	PCB	Phenanthrene	Fluoranthene	Pyrene
B 1021	1.5-2'	-	-	-	-	-	-	-	0.78	-	.14	-	-	-
	10.5-11.5'	-	-	-	-	-	-	-	0.87	-	-	-	-	-
B 1022	1.5-2'	43.	43.	44.	-	-	-	0.2	0.89	-	-	-	-	-
	8-9'	28.	64.	60.	17.	-	0.14	-	1.77	-	-	-	-	-
B 1023	1-2'	-	-	-	-	-	-	-	1.87	-	.48	-	-	-
	6-7'	-	-	-	-	-	-	-	0.82	-	-	-	-	-
B 1024	1-2'	-	-	-	-	-	-	-	1.85	-	.55	-	-	-
	6-7'	-	-	-	-	-	-	-	1.12	-	-	-	-	-
B 1025	0-2'	-	-	-	-	-	-	-	-	-	1.1	.30	.50	.50
	4.5-6'	-	-	-	-	-	-	-	0.5	-	1.7	-	.30	.20
	9.5-11.5'	-	-	-	-	-	-	-	0.6	-	-	-	-	-
B 1026	0-2'	34.	52.	238.	21.	-	0.06	-	0.3	-	-	.10	.20	.10
	4-6'	3.	57.	113.	14.	-	0.11	-	-	0.1	-	.20	.70	1.0
	10-12'	31.	79.	243.	35.	-	0.13	-	-	-	-	-	-	-
B 1027	0-2'	-	-	-	-	-	-	-	0.6	-	.14	-	-	-
	4.5-6.5'	-	-	-	-	-	-	-	-	-	.68	-	-	-
	9.5-11.5'	-	-	-	-	-	-	-	-	-	1.1	-	-	-
B 1028	0-2'	-	-	-	-	-	-	-	-	-	.63	.30	.80	.50
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1029	0-2'	-	-	-	-	-	-	-	0.3	-	1.5	-	-	-
	9-11'	-	-	-	-	-	-	-	0.3	-	-	-	-	-
B 1030	4.5-6.5'	-	-	-	-	-	-	-	0.6	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	0.8	-	-	-	-	-

TABLE 5.12, CONTINUED

Boring Number	Depth	Copper	Lead	Zinc	Nickel	Mercury	Thallium	Cyanide, total	Phenolics, total	Selenium	PCB	Phenanthrene	Fluoranthene	Pyrene
B 1031	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	0.6	-	-	-	-	-
B 1032	0-2'	-	-	-	-	-	-	-	0.5	-	.15	-	-	-
	5-7'	-	-	-	-	-	-	-	0.6	-	-	-	-	-
	10-11'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1033	0.5-1.5'	22.	20.	57.	5.	0.4	-	-	-	-	.27	-	-	-
	10-12'	105.	54.	174.	19.	0.2	0.05	-	-	-	-	-	.10	.10
	13-14'	67.	54.	159.	17.	0.1	0.07	-	-	-	-	-	-	-
B 1034	5-6.5'	-	-	-	-	-	-	-	0.4	-	-	-	-	-
	10-11'	-	-	-	-	-	-	-	0.4	-	-	-	-	-
B 1035	0-2'	-	-	-	-	-	-	-	-	-	.55	1.6	2.4	2.7
	5-7'	-	-	-	-	-	-	-	0.3	-	53.0	-	-	-
B 1036	1.5-2'	-	-	-	-	-	-	-	1.0	-	.32	-	-	-
	5.5-6.5'	-	-	-	-	-	-	-	0.5	-	-	-	-	-
	10.5-12'	-	-	-	-	-	-	-	1.0	-	-	-	-	-
B 1037	0-2'	70.	65.	130.	26.	0.1	0.07	-	0.3	-	.17	-	-	-
	4-8'	110.	48.	90.	22.	0.1	0.09	-	-	0.06	.10	-	-	-
	8-14'	10.	7.	50.	9.	-	0.08	-	0.7	-	-	-	-	-
B 1038	0-2'	-	-	-	-	-	-	-	0.3	-	-	1.0	1.9	1.2
	9.5-11.5'	-	-	-	-	-	-	-	0.4	-	-	-	-	-
B 1039	0-2'	-	-	-	-	-	-	-	-	-	.21	-	-	-
	4.5-6.5'	-	-	-	-	-	-	-	0.6	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	0.5	-	-	-	-	-

TABLE 5.12, CONTINUED

Boring Number	Depth	Copper	Lead	Zinc	Nickel	Mercury	Thallium	Cyanide, total	Phenolics, total	Selenium	PCB	Phenanthrene	Fluoranthene	Pyrene
B 1064	1-2'	-	-	-	-	-	-	-	-	-	.05	-	-	-
	5-6'	-	-	-	-	-	-	-	-	-	2.0	13.0	7.8	11.0
B 1069	8-10'	-	-	-	-	-	-	-	-	-	-	-	-	-
	14-16'	-	-	-	-	-	-	-	-	-	.39	-	-	-
B 1089	0-2'	-	-	-	-	-	-	-	-	-	1.1	.14	.17	.20
	4.5-6.5'	-	-	-	-	-	-	-	0.2	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	0.5	-	-	-	-	-
B 1092	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	-	-	-	-	-	0.4	-	-	-	-	-
B 1093	1.5-2'	-	-	-	-	-	-	-	0.4	-	.45	-	-	.10
	5-6.5'	-	-	-	-	-	-	-	0.6	-	-	-	-	-
B 1094	1-2'	-	-	-	-	-	-	-	0.4	-	15.0	-	-	.22
	5-6'	-	-	-	-	-	-	-	0.3	-	1.6	.17	.14	.14
B 1095	0-2'-	-	-	-	-	-	-	-	0.5	-	-	.20	.50	.50
	5-7'	-	-	-	-	-	-	-	0.4	-	-	-	-	-
B 1096	0.5-1.5'	22.	53.	60.	13.	-	0.10	5.6	0.6	0.05	-	-	-	-
	5.5-6.5'	44.	6.	80.	41.	-	0.11	-	0.6	-	-	-	-	-
B 1097	0.5-2.5'	-	-	-	-	-	-	-	4.2	-	.07	-	.50	.30
	4-6'	-	-	-	-	-	-	-	1.7	-	.10	-	-	-
	9-11'	-	-	-	-	-	-	-	1.0	-	-	-	-	-
B 1098	0-2'	43.	111.	154.	8.	0.3	0.12	-	0.6	-	.83	-	-	-
	8-9'	24.	-	113.	8.	-	0.17	-	-	-	-	-	-	-

TABLE 5.12, CONTINUED

Boring Number	Depth	Copper	Lead	Zinc	Nickel	Mercury	Thallium	Cyanide, total	Phenolics, total	Selenium	PCB	Phenanthrene	Fluoranthene	Pyrene
B 1099	1-3'	8.	-	29.	7.	-	0.33	-	0.9	-	.16	-	-	-
	4-6'	18.	-	45.	18.	-	0.77	-	0.4	.06	-	-	-	-
	9-11'	17.	-	67.	25.	-	0.79	-	0.4	-	-	-	-	-
	14-16'	31.	-	129.	43.	-	0.88	-	-	-	-	-	-	-
B 1100	0-2'	-	-	-	-	-	-	-	0.8	-	.56	-	-	-
	4-6'	-	-	-	-	-	-	-	0.3	-	-	-	-	-
B 1101	0-2'	-	-	-	-	-	-	-	0.6	-	48.0	.40	.70	.90
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1102	0-2'	-	-	-	-	-	-	-	-	-	.20	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 5.12, CONTINUED

Boring Number	Depth	bis(2-Ethylhexyl)-phthalate	Chrysene	Benzo(b)-fluoranthene, Benzo(k)-fluoranthene	Benzo(a)-pyrene	1,2-Dichloro-benzene	Diethyl phthalate	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate	Benzo(a)-anthracene	2,4-Dimethyl phenol	Phenol
B 1021	1.5-2'	-	-	-	-	-	-	-	-	-	-	-	-
	10.5-11.5'	-	-	-	-	-	-	-	-	-	-	-	-
B 1022	1.5-2'	-	-	-	-	-	-	-	-	-	-	-	-
	8-9'	-	-	-	-	-	-	-	-	-	-	-	-
B 1023	1-2'	-	-	-	-	-	-	-	-	-	-	-	-
	6-7'	-	-	-	-	-	-	-	-	-	-	-	-
B 1024	1-2'	-	-	-	-	-	-	-	-	-	-	-	-
	6-7'	-	-	-	-	-	-	-	-	-	-	-	-
B 1025	0-2'	-	.30	.40	.30	-	-	-	-	-	.30	-	-
	4.5-6'	-	.20	.70	.30	-	-	-	-	-	.20	-	-
	9.5-11.5'	-	-	-	-	-	-	-	-	-	-	-	-
B 1026	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	.40	.70	.60	-	-	-	-	-	.60	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-
B 1027	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-
	9.5-11.5'	-	-	-	-	-	-	-	-	-	-	-	-
B 1028	0-2'	-	.40	.60	.40	-	-	-	-	-	.30	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-
B 1029	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-
B 1030	4.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-

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TABLE 5.12, CONTINUED

Boring Number	Depth	bis(2-Ethylhexyl)-phthalate	Chrysene	Benzo(b)-fluoranthene, Benzo(k)-fluoranthene	Benzo(a)-pyrene	1,2-Dichloro-benzene	Diethyl phthalate	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate	Benzo(a)-anthracene	2,4-Dimethyl phenol	Phenol
B 1031	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-
B 1032	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	1.2	-	-	-	-	-	-	-	-	-	-	-
	10-11'	2.8	-	-	-	-	-	-	-	-	-	-	-
B 1033	0.5-1.5'	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-
	13-14'	2.1	-	-	-	-	-	-	-	-	-	-	-
B 1034	5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-
	10-11'	-	-	-	-	-	-	-	-	-	-	-	-
B 1035	0-2'	-	1.2	-	1.1	-	-	-	-	-	1.3	-	-
	5-7'	1.5	-	-	-	-	-	-	-	-	-	-	-
B 1036	1.5-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-6.5'	1.1	-	-	-	-	-	-	-	-	-	-	-
	10.5-12'	-	-	-	-	-	-	-	-	-	-	-	-
B 1037	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4-8'	-	-	-	-	-	-	-	-	-	-	-	-
	8-14'	-	-	-	-	-	-	-	-	-	-	-	-
B 1038	0-2'	-	.90	1.3	.80	-	-	-	-	-	.80	-	-
	9.5-11.5'	-	-	-	-	-	-	-	-	-	-	-	-
B 1039	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 5.12, CONTINUED

Boring Number	Depth	bis(2-Ethylhexyl)-phthalate	Chrysene	Benzo(b)-fluoranthene, Benzo(k)-fluoranthene	Benzo(a)-pyrene	1,2-Dichloro-benzene	Diethyl phthalate	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate	Benzo(a)-anthracene	2,4-Dimethyl phenol	Phenol
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-
B 1064	1-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5-6'	5.0	2.8	5.1	4.6	-	-	-	-	-	5.5	-	-
B 1069	8-10'	-	-	-	-	-	-	-	-	-	-	-	-
	14-16'	-	-	-	-	-	-	-	-	-	-	-	-
B 1089	0-2'	-	.12	-	-	-	-	-	-	-	.18	-	-
	4.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-
B 1092	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	1.3	-	-	-	-	-	-	-	-	-	-	-
B 1093	1.5-2'	-	-	-	-	-	-	-	-	-	-	-	-
	5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-
B 1094	1-2'	-	.15	.27	.31	-	-	-	-	-	.10	-	-
	5-6'	-	-	-	-	-	-	-	-	-	-	-	-
B 1095	0-2'	-	.30	.40	.30	-	-	-	-	-	.30	-	-
	5-7'	1.9	-	-	-	-	-	-	-	-	-	-	-
B 1096	0.5-1.5'	-	-	-	-	-	-	-	-	-	-	-	-
	5.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-
B 1097	0.5-2.5'	2.6	.30	.40	.30	.20	-	-	-	-	.30	-	-
	4-6'	1.1	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-
B 1098	0-2'	7.2	-	-	-	-	9.7	-	-	-	-	-	-
	8-9'	-	-	-	-	-	.20	-	-	-	-	-	-

TABLE 5.12, CONTINUED

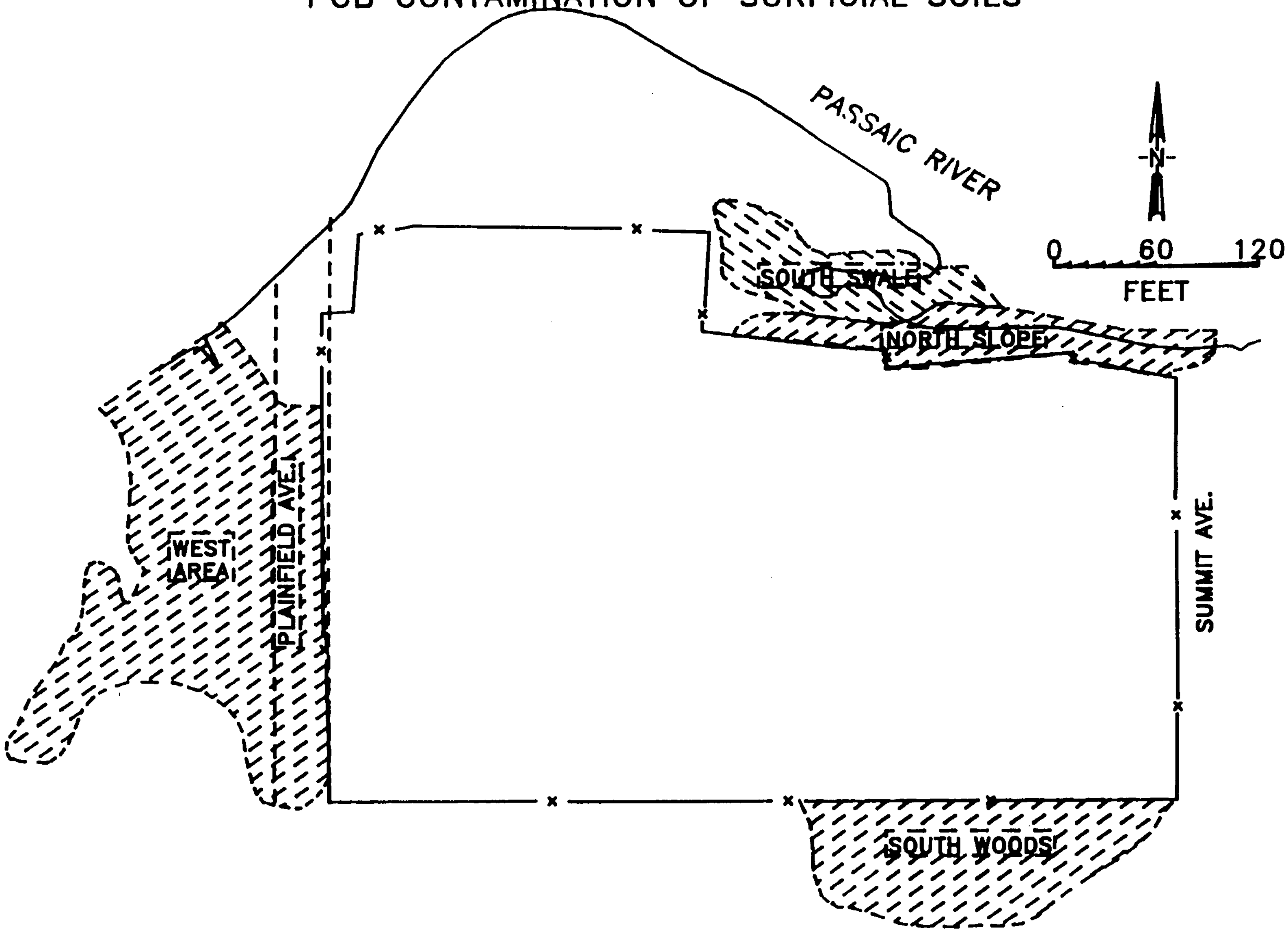
Boring Number	Depth	bis(2-Ethylhexyl)-phthalate	Chrysene	Benzo(b)-fluoranthene, Benzo(k)-fluoranthene	Benzo(a)-pyrene	1,2-Dichloro-benzene	Diethyl phthalate	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate	Benzo(a)-anthracene	2,4-Dimethyl phenol	Phenol
B 1099	1-3'	-	-	-	-	-	-	.60	.10	-	-	-	.30
	4-6'	1.3	-	-	-	-	-	-	-	.10	-	.20	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-
	14-16'	-	-	-	-	-	2.5	-	-	-	-	-	-
B 1100	0-2'	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-
B 1101	0-2'	2.1	.50	.60	-	-	-	-	-	-	.40	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-
B 1102	0-2'	-	-	-	-	-	3.8	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	.30	-	-	-	-
	9-11'	1.0	-	-	-	-	-	-	.20	-	-	-	-

Note: The locations of borings shown in Figure 5.11.

Only compounds which were detected in one or more samples are reported.

FIGURE 5.12

AREAS OF OFF–SITE
PCB CONTAMINATION OF SURFICIAL SOILS



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The level of PCB contamination that was used as a cutoff for the off-site cleanup was 1 ppm. The Interim Remedial Action Soil Storage Area is atop the slab which covers the north chemical lagoon. It is constructed as shown in Figure 5.13. For more information regarding this cleanup the reader is directed to "A Report Describing An Interim Off-Site Remedial Action at the Gulf Oil Products Company's Former Plant Site, Berkeley Heights, New Jersey" (Engineering-Science, May, 1984) and "1985 Interim Off Site Remedial Action, Berkeley Heights, New Jersey" (Engineering-Science, October, 1988).

During Phase 2 ES performed a total of thirty-four soil borings off-site. Some of the borings were installed in a line around the west, south, and east sides of the plant site 30 feet outside the plant fence. The remainder of the borings were placed north of the plant between the fence and the Passaic River. All borings were completed to the top of the glacial lake deposits and were sampled at various depths for PCBs, organic chemicals and (in some cases) metals. Figure 5.11 shows the locations of the off-site borings.

The proximity of the contamination sources on the site to the Passaic River has been an area of concern since project inception. ES has collected samples of river water and sediment during both Phase 1 and Phase 2 to determine what impact the site may have upon the river's ecosystem.

ES collected samples of river water at the site of one of the seeps on September 28, 1983. Samples were also collected of the material emanating from the seeps and of the river water downstream of the plant. River sediment samples were collected on November 10, 1983 upstream of the plant, at the site of the seeps and downstream of the plant. River water samples were collected on December 19, 1984 at the site of an apparent oil sheen upstream of the plant site. Finally, additional sediment samples were collected as before on September 18, 1985. All of the above samples were analyzed for PCBs, organic chemicals and (in some cases) metals.

Table 5.13 shows the results of Phase 1 sampling for chlorobenzene and ethylbenzene. Examination reveals high levels of indicator volatiles in boring C-5, C-7 and C-8. Borings C-9 and C-6 show moderate levels of indicator volatiles. Table 5.14 shows the results of Phase 2 off-site sampling. Results in this table show that low levels of volatiles, low to high levels of PCBs and low to moderate levels of base/neutral compounds may be found off-site in isolated locations. For the most part, these locations correspond to areas adjacent to either an on-site contamination source or to the sanitary sewer line east of the plant site.

Two Phase 2 off-site borings exhibited concentrations of metals above "typical" background levels. Borings B1072 and B1074 both contained elevated levels of mercury in the top two feet of the borings. These borings were completed in an area which has previously been

FIGURE 5.13

SECTIONAL VIEW OF TEMPORARY SOILS STORAGE AREA

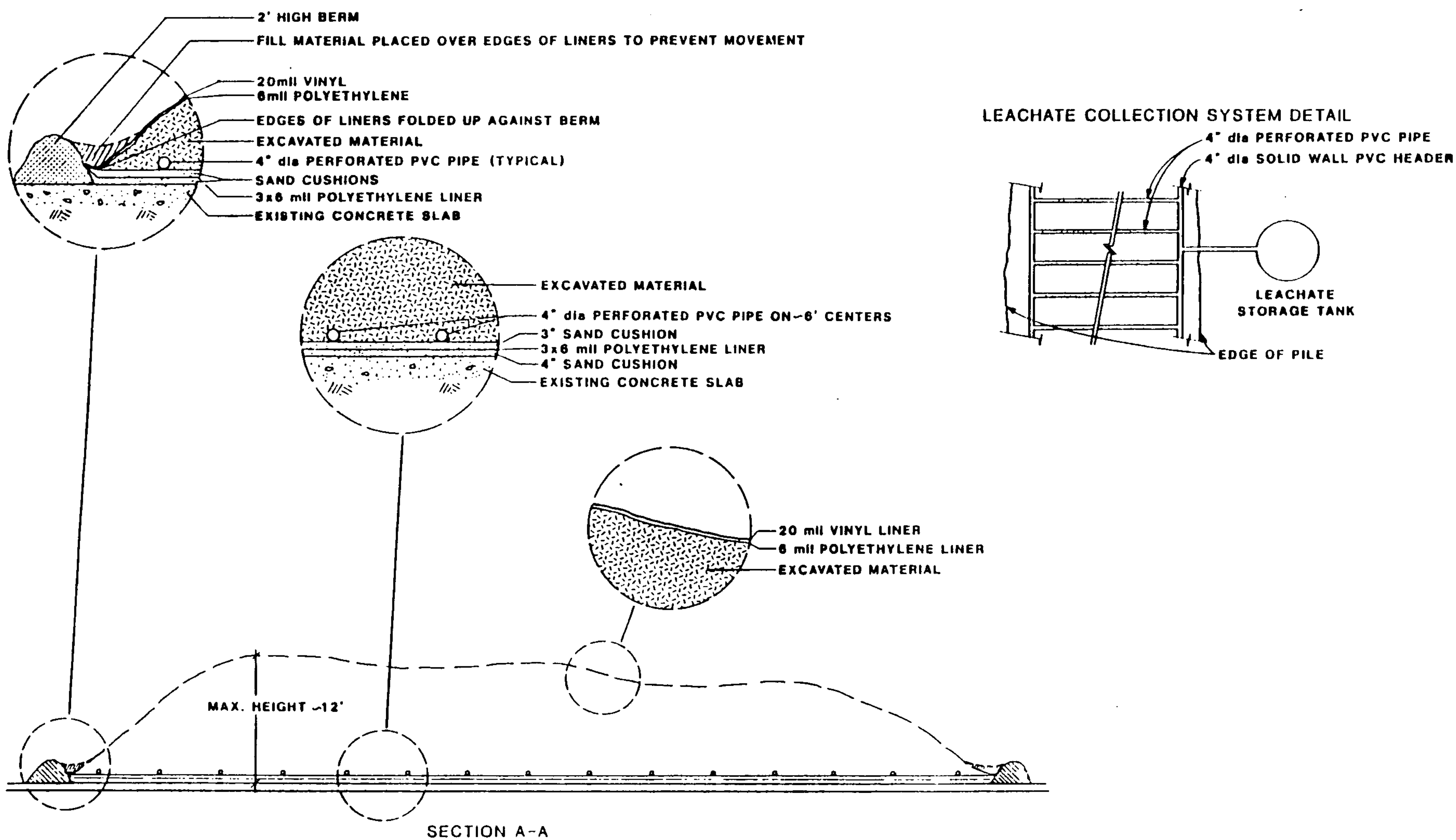

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TABLE 5.13

PHASE I ANALYSIS OF ETHYLBENZENE AND CHLOROBENZENE IN SOIL

Sample	Ethylbenzene (mg/kg)	Chlorobenzene (mg/kg)
C-5a	182	81
C-5b	67	105
C-5c	<2	<3
C-5d	4	8
C-5e	<2	6
C-6a	<2	<3
C-6b	13	27
C-6c	3	19
C-6d	9	10
C-7a	<2	<3
C-7b	201	341
C-7c	272	667
C-7d	2,225	10,600
C-7e	232	381
C-8a	15	52
C-8b	455	518
C-8c	272	211
C-8d	15	52
C-8e	44	104
C-9a	21	58
C-9b	<2	<3
C-9c	<2	<3
C-9d	<2	<3
C-9e	<2	<3
C-10a	<2	<3
C-10b	<2	<3
C-10c	<2	<3
C-10d	<2	<3
C-10e	<2	<3
C-11b	5	23
C-11c	5	17
C-11e	8	25
C-9d Dup	<2	<3
C-10e Dup	<2	<3
C-9c Spk	5 (54% recovery)	9 (74% recovery)
C-10e Spk	5 (50% recovery)	8 (61% recovery)

Note:
a = 0.0 - 1.0 ft.
b = 1.0 - 2.0 ft.
c = 2.0 - 3.0 ft.
d = 3.0 - 4.0 ft.
e = 4.0 - 5.0 ft.

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TABLE 5.14

RESULTS OF PHASE 2 OFF-SITE SAMPLING
(ALL RESULTS IN MG/KG)

Boring Number	Depth	Xylene	Ethylbenzene	Cadmium	Arsenic	Beryllium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium
B 1070	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1071	5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1072	0-2'	-	-	-	1.5	0.60	16.	190.	110.	1.3	20.	0.07	2.	-
	5-7'	-	-	-	1.1	0.52	12.	14.	24.	-	9.	-	-	-
	10-11'	-	-	-	1.6	0.52	13.	21.	-	0.2	13.	-	-	-
B 1073	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1074	0-2'	-	-	-	1.3	0.60	15.	210.	61.	4.9	18.	0.07	-	-
	5-7'	.05	-	-	1.6	0.85	19.	35.	42.	0.2	22.	-	-	0.07
	10-12'	-	-	-	1.0	0.67	20.	25.	14.	-	20.	-	-	0.12
B 1075	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1076	4.5-6.5'	-	.03	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	.03	-	-	-	-	-	-	-	-	-	-	-
B 1077	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.5-6.5'	-	.04	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	.03	-	-	-	-	-	-	-	-	-	-	-
B 1078	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.5-15.5'	-	.08	-	-	-	-	-	-	-	-	-	-	-

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TABLE 5.14, CONTINUED

Boring Number	Depth	Xylene	Ethylbenzene	Cadmium	Arsenic	Beryllium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium
B 1079	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1080	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1081	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1082	0-2'	-	-	-	0.9	1.0	25.	12.	44.	-	15.	-	-	0.03
	5-7'	-	-	3.0	1.8	1.4	43.	26.	73.	-	30.	-	-	0.04
B 1083	0-2'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1084	1.5-3.5'	-	-	-	2.0	1.2	37.	25.	65.	-	28.	-	-	0.05
B 1085	0-2'	-	-	-	0.9	0.8	22.	8.	33.	-	11.	-	-	0.04
	5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1086	1.5-3.5'	-	-	-	1.5	0.7	14.	12.	39.	-	14.	-	-	0.04
B 1087	1.5-3.5'	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	.08	-	-	-	-	-	-	-	-	-	-	-	-
B 1088	2-4'	-	-	-	-	-	-	-	-	-	-	-	-	-
S1	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-
S2	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-
S3	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-
S4	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-
S5	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-
S6	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-
S7	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-
S8	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 5.14, CONTINUED

Boring Number	Depth	Xylene	Ethylbenzene	Cadmium	Arsenic	Beryllium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium
S9	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-
S10	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-
S11	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-
S12	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-
S13	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 5.14, CONTINUED

Boring Number	Depth	2-Chlorophenol	Zinc	Phenolics, total	PCB	bis(2-Ethylhexyl)-phthalate	Benzo(a)-anthracene	Benzo(b)-fluoranthene, Benzo(k)-fluoranthene	Chrysene	Diethyl phthalate	Fluoranthene	Phenanthrene	Pyrene	Benzo(a) pyrene	Di-n-butyl phthalate
B 1070	0-2'	-	-	0.4	12.8	-	.78	-	-	-	1.1	.93	1.3	-	-
	5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	0.3	-	1.2	-	-	-	-	-	-	-	-	-
B 1071	5-7'	-	-	0.3	.16	-	.43	.24	.14	-	.70	.60	.51	-	-
	10-12'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1072	0-2'	-	330.	0.6	.35	-	-	-	-	-	-	-	-	-	-
	5-7'	-	23.	0.5	-	-	-	-	-	-	-	-	-	-	-
	10-11'	-	40.	0.6	-	-	-	-	-	-	-	-	-	-	-
B 1073	0-2'	-	-	0.3	1.2	-	-	-	-	-	-	-	-	-	-
	4.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1074	0-2'	-	80.	-	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	80.	-	.19	1.0	-	-	-	-	-	-	-	-	-
	10-12'	.12	80.	0.3	-	-	-	-	-	-	-	-	-	-	-
B 1075	0-2'	-	-	-	.12	-	-	-	-	-	-	-	-	-	-
	4.5-7'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-
B 1076	4.5-6.5'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-
B 1077	0-2'	-	-	0.6	.14	-	.10	-	-	-	.20	.20	.20	-	-
	4.5-6.5'	-	-	0.7	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	0.7	-	-	-	-	-	-	-	-	-	-	-
B 1078	0-2'	-	-	0.4	100.0	-	.22	.25	.14	-	.26	.21	.23	.22	-
	13.5-15.5'	-	-	0.6	-	-	-	-	-	-	-	-	-	-	-

MAC/SY027/00034

TABLE 5.14, CONTINUED

Boring Number	Depth	2-Chlorophenol	Zinc	Phenolics, total	PCB	bis(2-Ethylhexyl)-phthalate	Benzo(a)-anthracene	Benzo(b)-fluoranthene, Benzo(k)-fluoranthene	Chrysene	Diethyl phthalate	Fluoranthene	Phenanthrene	Pyrene	Benzo(a) pyrene	Di-n-butyl phthalate
B 1079	0-2'	-	-	-	.06	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B 1080	0-2'	-	-	0.4	1.0	-	-	.20	-	-	.20	-	.10	-	-
	4-6'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-11'	-	-	1.2	-	1.2	-	-	-	-	-	-	-	-	-
B 1081	0-2'	-	-	1.0	.08	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-
	10-12'	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-
B 1082	0-2'	-	57.	-	.096	-	-	-	-	-	-	-	-	-	-
	5-7'	-	171.	-	-	-	-	-	-	-	-	-	-	-	.10
B 1083	0-2'	-	-	0.6	-	-	-	-	-	-	-	-	-	-	-
B 1084	1.5-3.5'	-	NR	-	-	-	-	-	-	-	-	-	-	-	-
B 1085	0-2'	-	78.	0.3	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	0.8	-	-	-	-	-	-	-	-	-	-	-
B 1086	1.5-3.5'	-	44.	0.3	-	-	-	-	-	.20	-	-	-	-	-
B 1087	1.5-3.5'	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-
	5-7'	-	-	1.2	-	-	-	-	-	-	-	-	-	-	-
B 1088	2-4'	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S1	(PCB only)	-	-	-	.08	-	-	-	-	-	-	-	-	-	-
S2	(PCB only)	-	-	-	2.6	-	-	-	-	-	-	-	-	-	-
S3	(PCB only)	-	-	-	6.0	-	-	-	-	-	-	-	-	-	-
S4	(PCB only)	-	-	-	4.6	-	-	-	-	-	-	-	-	-	-
S5	(PCB only)	-	-	-	3.3	-	-	-	-	-	-	-	-	-	-

TABLE 5.14, CONTINUED

Boring Number	Depth	2-Chlorophenol	Zinc	Phenolics, total	PCB	bis(2-Ethylhexyl)-phthalate	Benzo(a)-anthracene	Benzo(b)-fluoranthene, Benzo(k)-fluoranthene	Chrysene	Diethyl phthalate	Fluoranthene	Phenanthrene	Pyrene	Benzo(a) pyrene	Di-n-butyl phthalate
S6	(PCB only)	-	-	-	.78	-	-	-	-	-	-	-	-	-	-
S7	(PCB only)	-	-	-	.20	-	-	-	-	-	-	-	-	-	-
S8	(PCB only)	-	-	-	8.6	-	-	-	-	-	-	-	-	-	-
S9	(PCB only)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S10	(PCB only)	-	-	-	19.2	-	-	-	-	-	-	-	-	-	-
S11	(PCB only)	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-
S12	(PCB only)	-	-	-	179.	-	-	-	-	-	-	-	-	-	-
S13	(PCB only)	-	-	-	33.1	-	-	-	-	-	-	-	-	-	-

Notes: Only compounds which were detected in one or more samples are reported.

The locations of borings and surface samples shown in this table may be found in Figure 5.11.

NR: Not reported by laboratory.

excavated and filled with borrow dirt from a remote source. This area of the site (outside the west fence) was extensively excavated during the interim remedial action (for PCBs) in 1983. The fact that elevated mercury appears in both these borings at zero to two feet below grade (but not below that) indicates that the mercury was brought in with the borrow dirt used to backfill this area and is not a result of site activities.

The sanitary sewer line which crosses the plant site has apparently acted as a collection point for contaminated groundwater which moved along the bedding material around the pipe. Some contamination is present around the pipe off-site to the east based upon analytical results from samples collected from well 0-5 (see Chapter 6). The extent of this movement along the sewer line is not known. At the present time limited groundwater level data indicate that the gradient along the sewer line generally slopes from east to west (from 0-5 toward the site) indicating that transport of contaminants along the sewer from the plant toward 0-5 may only be intermittent. The full extent of contamination around the sewer line will be determined during the site remedial action. All contaminated material around the line will be removed at that time.

High levels of PCB contamination were found in boring B1078 (see Figure 5.11). This boring is on a rise in the ground (5 to 6 feet above adjacent plant site elevation) and is in the area of a possible dump not associated with the Millmaster Onyx plant. The sample in boring B1078 which exhibited high levels of PCB (ES No. 5089) contains only Arochlors 1254 and 1260. The primary Arochlor used in the hot oil heating system on-site was Arochlor 1248. Although these results are not consistent with most of the on-site PCB samples for the purpose of site remediation it will be assumed that the PCBs in this boring came from site sources.

The dump, which is adjacent to the southwest corner of the plant site, operated over a period of about twenty years. The aerial photographs reproduced in Appendix K show evidence of the landfill's operation between about 1950 and 1970 in the photos dated 1951, 1959, and 1969. (The 1969 photo in Appendix K was cropped from the original print, which shows the operation.) The area was used by a Berkeley Heights' resident during this period (interview by R. S. Dykes (ES) with local resident, April, 1985).

Table 5.15 lists the results of Phase 1 and Phase 2 sampling of the Passaic River. Examination reveals that high concentrations of volatile organics exist in the material emanating from the seeps in the river bank but none of these compounds exists above detection limits in the river water itself. Additionally low levels of base/neutral compounds exist in the river sediment both above and below the plant site. Low levels of PCBs exist in the sediment immediately adjacent to the plant site (near the CWL and PSA).

TABLE 5.15

RESULTS OF WATER, SEDIMENT AND SURFACE SAMPLES (ALL RESULTS ARE IN MG/L OR MG/KG)

Boring Number	Chlorobenzene	Tetrachloro-ethene	Ethylbenzene	Toluene	1,2-Dichloro-benzene	1,3-Dichloro-benzene	3-3'-Dichloro-benzidine	Methylene chloride	Arsenic	Beryllium	Chromium
S1(9/29/83)[1]	73.6	6.8	>15.6	2.6	214.0	4.4	54.7	-	-	-	-
R1(9/29/83)[2]	-	-	-	-	-	-	-	.02	-	-	-
R2(9/29/83)[3]	-	-	-	-	-	-	-	.01	-	-	-
Upstream, C.L.(11/10/83)[4]	-	-	-	-	-	-	-	.08	-	-	-
Upstream, Bank(11/10/83)[4]	-	-	-	-	-	-	-	-	-	-	-
Site, C.L.(11/10/83)[5]	-	-	-	-	-	-	-	.28	-	-	-
Site, Bank(11/10/83)[5]	-	-	-	-	-	-	-	.41	-	-	-
Downstream, C.L.(11/10/83)[6]	-	-	-	-	-	-	-	-	-	-	-
Downstream, Bank(11/10/83)[6]	-	-	-	-	-	-	-	.06	-	-	-
Upstream(12/9/84)[7]	-	-	-	-	-	-	-	-	-	-	-
Site 2 (12/9/84)[8]	-	-	-	-	-	-	-	-	-	-	-
Site 2A (12/9/84)[9]	-	-	-	-	-	-	-	-	-	-	-
Downstream (12/9/84)[10]	-	-	-	-	-	-	-	-	-	-	-
Upstream, C.L. (9/18/85)[4]	-	-	-	-	-	-	-	-	-	-	-
Upstream, Bank(9/18/85)[4]	-	-	-	-	-	-	-	-	5.9	1.2	20.
Site, C.L.(9/18/85)[5]	-	-	-	-	-	-	-	-	-	-	-
Site, Bank(9/18/85)[5]	-	-	-	-	-	-	-	-	1.7	0.8	20.
Downstream, C.L.(9/18/85)[6]	-	-	-	-	-	-	-	-	-	-	-
Downstream, Bank(9/18/85)[6]	-	-	-	-	-	-	-	-	2.4	0.9	18.

MAC/SY027/00032

TABLE 5.15, CONTINUED

Boring Number	Copper	Lead	Mercury	Nickel	Thallium	Zinc	Phenolics, total	PCB	Benzo(a)-anthracene	Benzo(a) pyrene	Benzo(b)-fluoranthene, Benzo(k) fluoranthene
S1(9/29/83)[1]	-	-	-	-	-	-	-	-	-	-	-
R1(9/29/83)[2]	-	-	-	-	-	-	-	-	-	-	-
R2(9/29/83)[3]	-	-	-	-	-	-	-	-	-	-	-
Upstream, C.L.(11/10/83)[4]	-	-	-	-	-	-	-	-	-	-	-
Upstream, Bank(11/10/83)[4]	-	-	-	-	-	-	-	-	-	-	-
Site, C.L.(11/10/83)[5]	-	-	-	-	-	-	-	-	-	-	-
Site, Bank(11/10/83)[5]	-	-	-	-	-	-	-	-	-	-	-
Downstream, C.L.(11/10/83)[6]	-	-	-	-	-	-	-	-	-	-	-
Downstream, Bank(11/10/83)[6]	-	-	-	-	-	-	-	-	-	-	-
Upstream(12/9/84)[7]	-	-	-	-	-	-	-	-	-	-	-
Site 2 (12/9/84)[8]	-	-	-	-	-	-	-	-	-	-	-
Site 2A (12/9/84)[9]	-	-	-	-	-	-	-	-	-	-	-
Downstream (12/9/84)[10]	-	-	-	-	-	-	-	-	-	-	-
Upstream, C.L. (9/18/85)[4]	-	-	-	-	-	-	0.5	-	.20	-	.20
Upstream, Bank(9/18/85)[4]	23.	55.	0.1	22.	0.08	221.	-	-	-	-	-
Site, C.L.(9/18/85)[5]	-	-	-	-	-	-	0.2	.59	.10	-	.20
Site, Bank(9/18/85)[5]	36.	71.	0.2	24.	0.06	219.	-	5.3	-	-	-
Downstream, C.L.(9/18/85)[6]	-	-	-	-	-	-	0.2	.40	.30	.60	.80
Downstream, Bank(9/18/85)[6]	28.	45.	-	20.	0.07	208.	0.7	-	-	-	-

MAC/SY027/00032

TABLE 5.15, CONTINUED

Boring Number	bis(2-Ethylhexyl)-phthalate	Chrysene	Fluoranthene	Phenanthrene	Pyrene	Sample Medium
S1(9/29/83)[1]	-	-	-	-	-	Soil + HC
R1(9/29/83)[2]	-	-	-	-	-	Water
R2(9/29/83)[3]	-	-	-	-	-	Water
Upstream, C.L.(11/10/83)[4]	-	-	-	-	-	Sediment
Upstream, Bank(11/10/83)[4]	-	-	-	-	-	Sediment
Site, C.L.(11/10/83)[5]	-	-	-	-	-	Sediment
Site, Bank(11/10/83)[5]	-	-	-	-	-	Sediment
Downstream, C.L.(11/10/83)[6]	-	-	-	-	-	Sediment
Downstream, Bank(11/10/83)[6]	-	-	-	-	-	Sediment
Upstream(12/9/84)[7]	-	-	-	-	-	Water
Site 2 (12/9/84)[8]	-	-	-	-	-	Water
Site 2A (12/9/84)[9]	-	-	-	-	-	Water
Downstream (12/9/84)[10]	-	-	-	-	-	Water
Upstream, C.L. (9/18/85)[4]	2.4	.20	.30	.10	.30	Sediment
Upstream, Bank(9/18/85)[4]	-	-	-	-	-	Sediment
Site, C.L.(9/18/85)[5]	-	-	.30	.15	.20	Sediment
Site, Bank(9/18/85)[5]	-	-	-	-	-	Sediment
Downstream, C.L.(9/18/85)[6]	-	.40	.50	.20	.50	Sediment
Downstream, Bank(9/18/85)[6]	-	-	-	-	-	Sediment

(1) Sample of hydrocarbon seep at edge of water.
(2) Water sample at S1
(3) Water sample downstream of R1
(4) Sample location approximately 500' upstream of site.
(5) Sample location adjacent to PSA in river.
(6) Sample location approximately 500' downstream of site.
(7) 500' upstream of site
(8) Near apparent oil sheen on river.
(9) Downstream of apparent oil sheen.
(10) 500' downstream of site

The conclusions which may be drawn concerning off-site contamination based on Phase 1 and Phase 2 data are as follows:

1. Contaminated areas off-site are limited in extent. However, because sampling was limited to thirty feet from the fence contaminants which were detected may extend out further than this distance.

2. Contamination is in the low to moderate range for volatiles and base/neutrals. PCBs are high off-site in only two locations. Elevated off-site metals concentrations are probably characteristic of the fill dirt brought in during the 1983 interim remedial action.

3. The off-site contaminated areas are primarily adjacent to on-site contamination sources. The interim remedial action (1983-1985) succeeded in removing all off-site PCB contaminated soil with the exception of two small areas.

4. The site's impact on the Passaic River is minimal based upon Phase 1 and Phase 2 data.

SUMMARY OF PHASE 1 AND PHASE 2 SAMPLE RESULTS

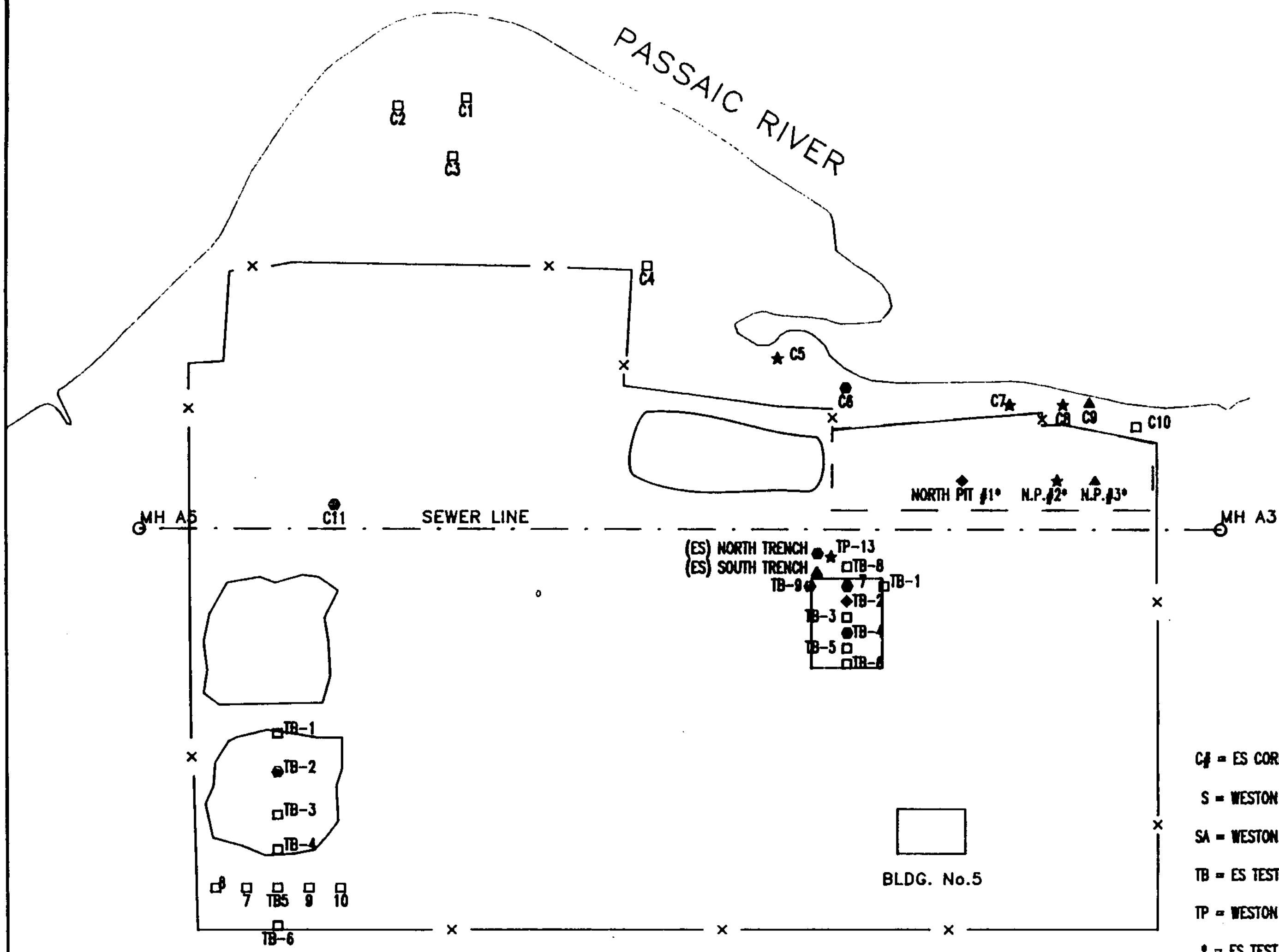
In order to better understand the overall levels of contamination at the site and its location a series of summary figures has been prepared to assist the reader in disseminating the mass of data presented in the Contamination Assessment Report update.

Phase 1 data is summarized in Figures 5.14, 5.15, 5.16, and 5.17. Figure 5.14 shows all Phase 1 sampling locations and the corresponding levels of total volatile contamination. Figures 5.15 through 5.17 show Phase 1 PCB sample results.

Figures 5.18 through 5.28 give Phase 2 sample results. Figure 5.18 shows all Phase 2 sampling locations and the results of total volatiles analyses in each boring. Figures 5.19, 5.20, and 5.21 show the same compounds (total volatiles) in cross-section at various points. Figure 5.22 is an overall site view showing Phase 2 PCB results. Figures 5.23 and 5.24 show Phase 2 PCB contamination in cross section. Figure 5.25 shows an overall site view of Phase 2 sample results for total Polynuclear Aromatics (PNAs), Phthalates and Chlorinated Benzenes. These compounds are also referred to as base/neutral compounds. Figures 5.26, 5.27, and 5.28 show these compounds in cross section.

FIGURE 5.14

PHASE 1 SAMPLE LOCATIONS
TOTAL VOLATILES



LEGEND

TOTAL VOLATILE CONCENTRATION OF HIGHEST SAMPLE IN BORING TEST PIT OR SURFACE SAMPLE

- □ < 5 ppm
- ◆ 5 TO 10 ppm
- ● 10 TO 50 ppm
- ▲ 50 TO 100 ppm
- ★ > 100 ppm

NOTE: THE SAMPLING LOCATIONS SHOWN ON THIS FIGURE ARE APPROXIMATE

C# = ES CORE SAMPLE
S = WESTON SURFACE SAMPLE
SA = WESTON SURFACE COMPOSITE
TB = ES TEST BORING
TP = WESTON TEST PIT
* = ES TEST PIT

-N-

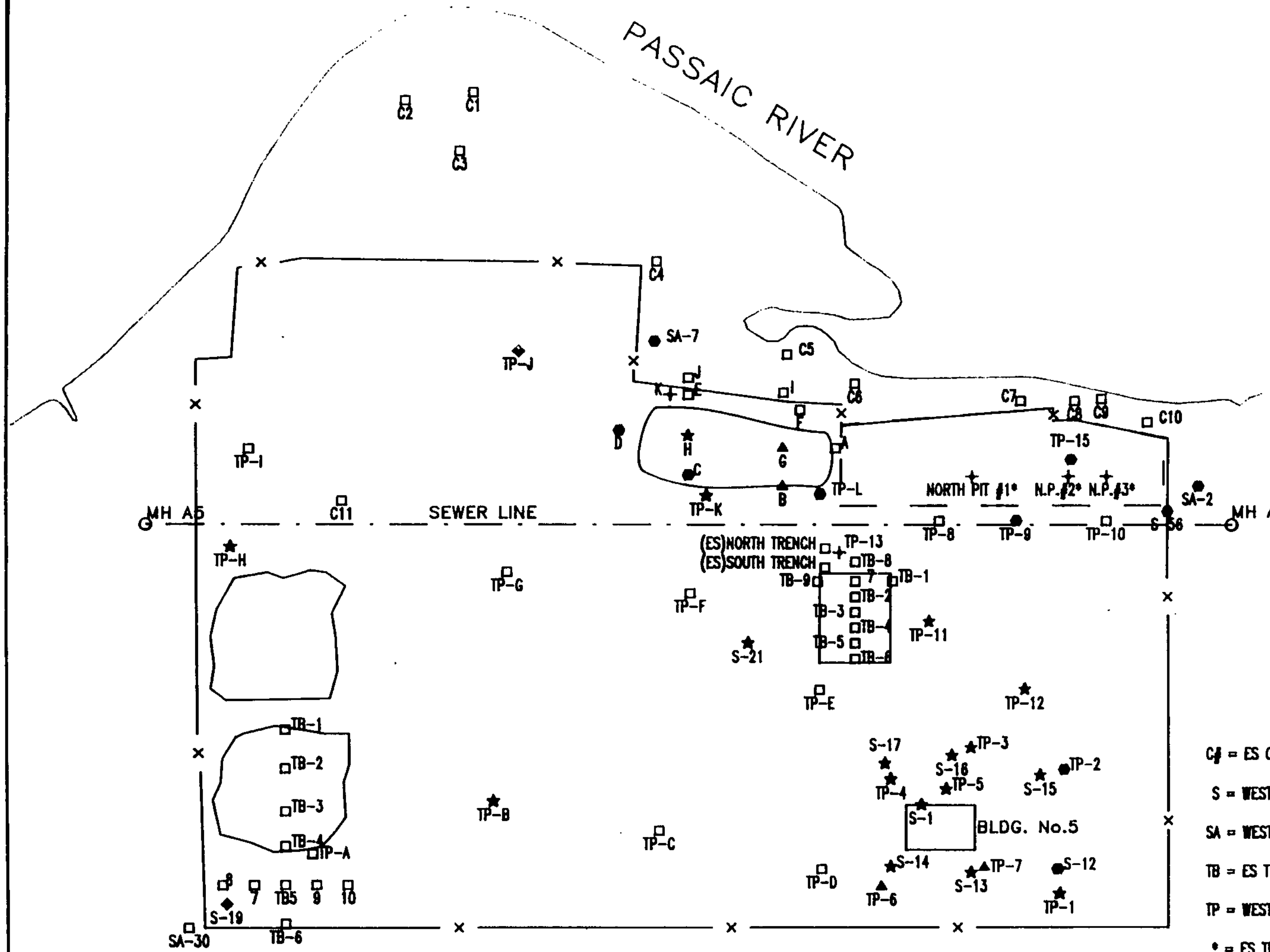
0 60 120
FEET

SCALE:1" = 60'

ES ENGINEERING-SCIENCE

FIGURE 5.15

PHASE 1 SAMPLE LOCATIONS TOTAL PCB AROCLORS



LEGEND

TOTAL PCB CONCENTRATION OF HIGHEST SAMPLE IN BORING, TEST PIT OR SURFACE SAMPLE

- □ < 5 ppm
- ◆ 5 TO 10 ppm
- ● 10 TO 50 ppm
- ▲ 50 TO 100 ppm
- ★ > 100 ppm
- + NO PCB SAMPLES COLLECTED

NOTE: THE SAMPLING LOCATIONS SHOWN ON THIS FIGURE ARE APPROXIMATE

C# = ES CORE SAMPLE

S = WESTON SURFACE SAMPLE

SA = WESTON SURFACE COMPOSITE

TB = ES TEST BORING

TP = WESTON TEST PIT

* = ES TEST PIT

OTHER POINTS SHOWN WITH ALPHABETIC DESIGNATIONS ARE WESTON BORINGS

-N-

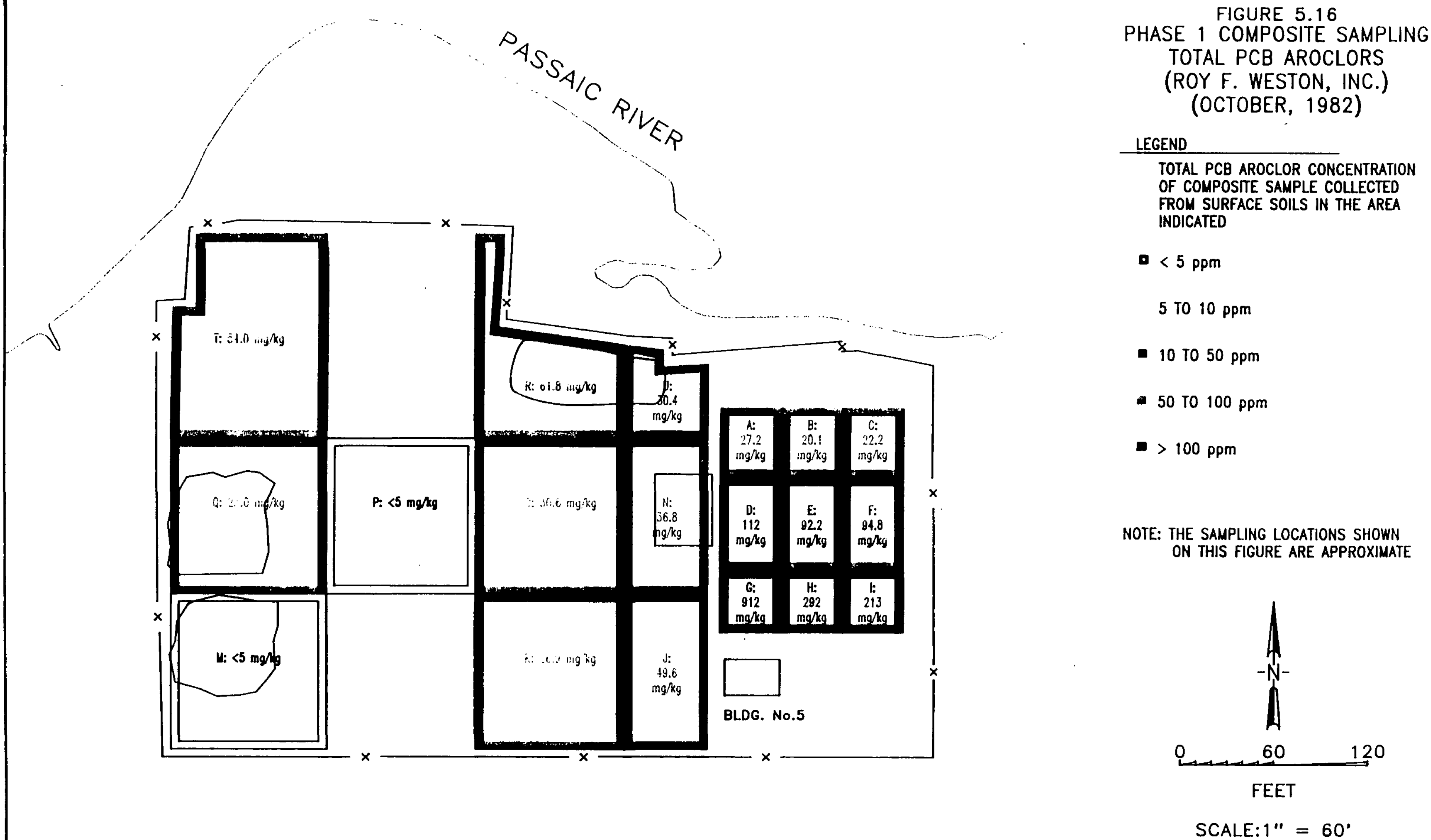
0 60 120

FEET

SCALE:1" = 60'

BH/B:BH5.15

FIGURE 5.16
PHASE 1 COMPOSITE SAMPLING
TOTAL PCB AROCLORS
(ROY F. WESTON, INC.)
(OCTOBER, 1982)



LEGEND

TOTAL PCB AROCLOR CONCENTRATION OF COMPOSITE SAMPLE COLLECTED FROM SURFACE SOILS IN THE AREA INDICATED

- < 5 ppm
- 5 TO 10 ppm
- 10 TO 50 ppm
- 50 TO 100 ppm
- > 100 ppm

NOTE: THE SAMPLING LOCATIONS SHOWN ON THIS FIGURE ARE APPROXIMATE

ES ENGINEERING-SCIENCE

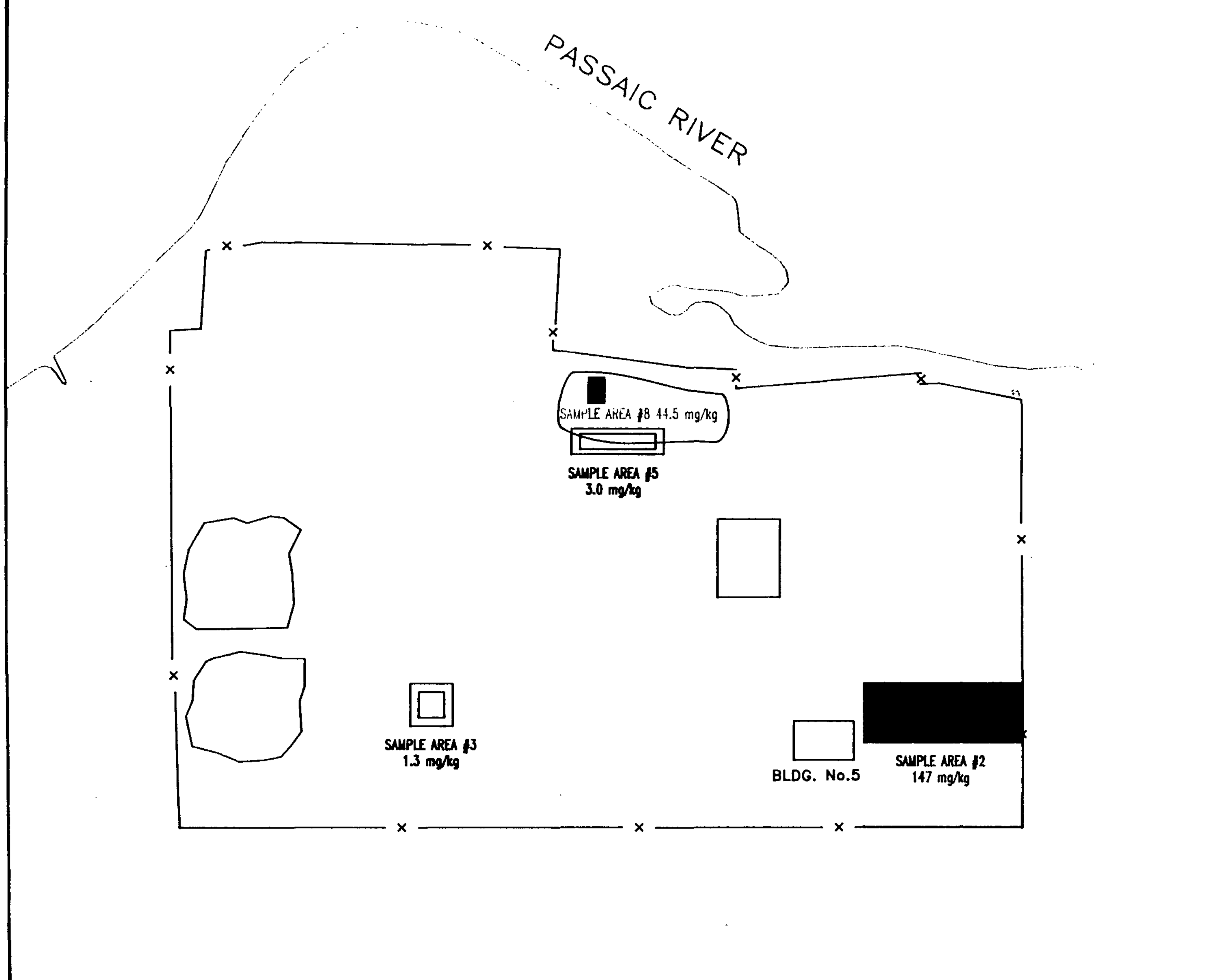


FIGURE 5.17

PHASE 1 TEST-BURN SAMPLING
TOTAL PCB AROCLORS
(ENGINEERING-SCIENCE, INC.)

LEGEND

TOTAL PCB AROCLOR CONCENTRATION OF COMPOSITE SAMPLE COLLECTED FROM SURFACE AND/OR SUBSURFACE SOILS IN THE AREA INDICATED

- < 5 ppm
- 5 TO 10 ppm
- 10 TO 50 ppm
- 50 TO 100 ppm
- > 100 ppm

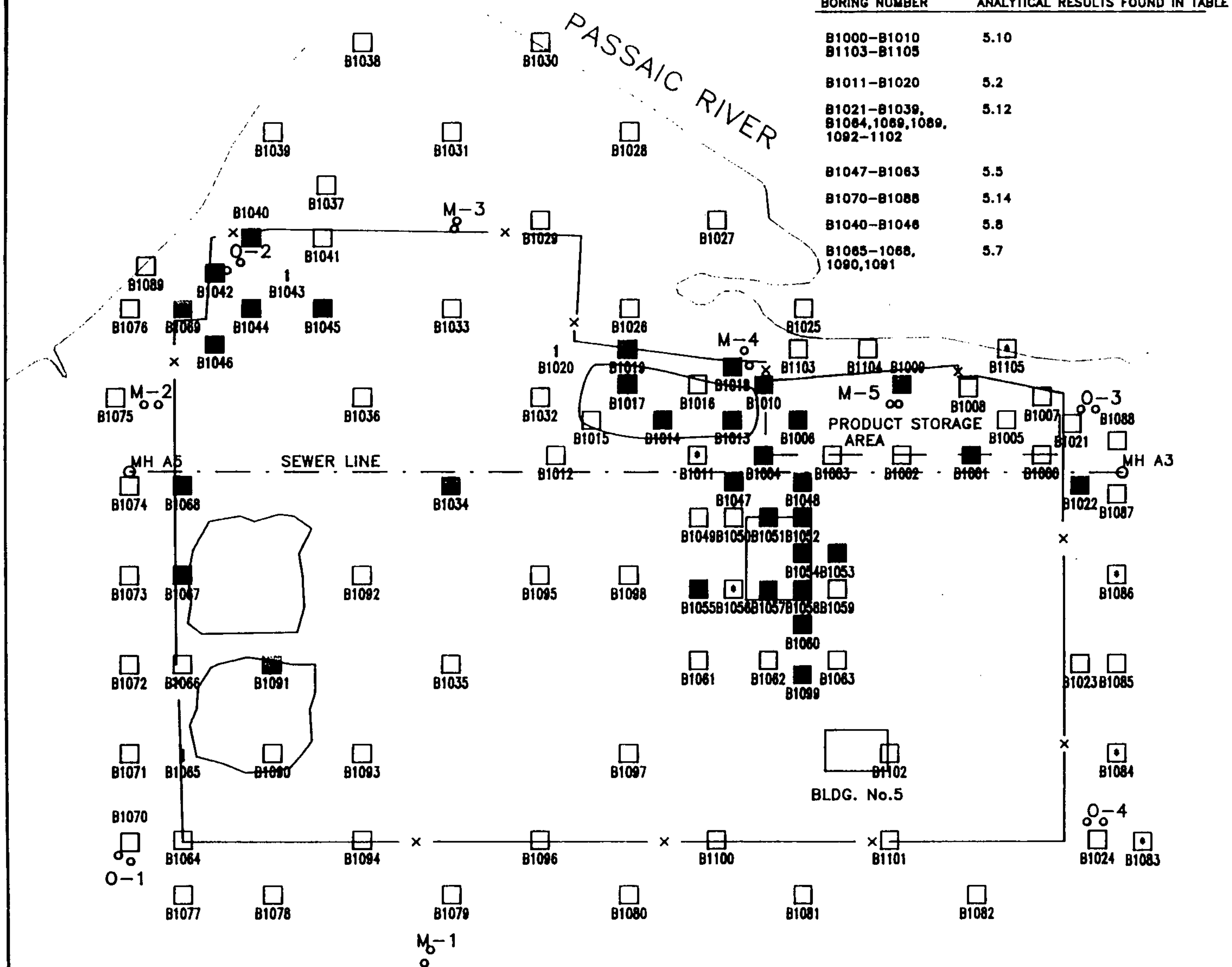
NOTE: THE SAMPLING LOCATIONS SHOWN ON THIS FIGURE ARE APPROXIMATE

8H/81BH5.17

ES ENGINEERING-SCIENCE

FIGURE 5.18

PHASE 2 SAMPLE RESULTS
TOTAL VOLATILES



BORING NUMBER	ANALYTICAL RESULTS FOUND IN TABLE
B1000-B1010 B1103-B1105	5.10
B1011-B1020	5.2
B1021-B1039, B1064,1069,1089, 1092-1102	5.12
B1047-B1063	5.5
B1070-B1088	5.14
B1040-B1046	5.8
B1065-1068, 1090,1091	5.7

LEGEND

TOTAL VOLATILE CONCENTRATION
OF HIGHEST SAMPLE IN BORING

□ < 5 ppm

1 5 TO 10 ppm

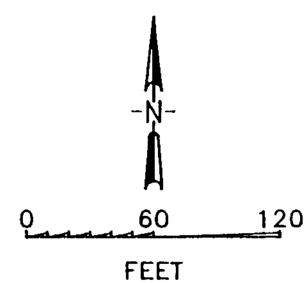
■ 10 TO 50 ppm

■ 50 TO 100 ppm

■ > 100 ppm

⊡ NO VOA SAMPLES COLLECTED

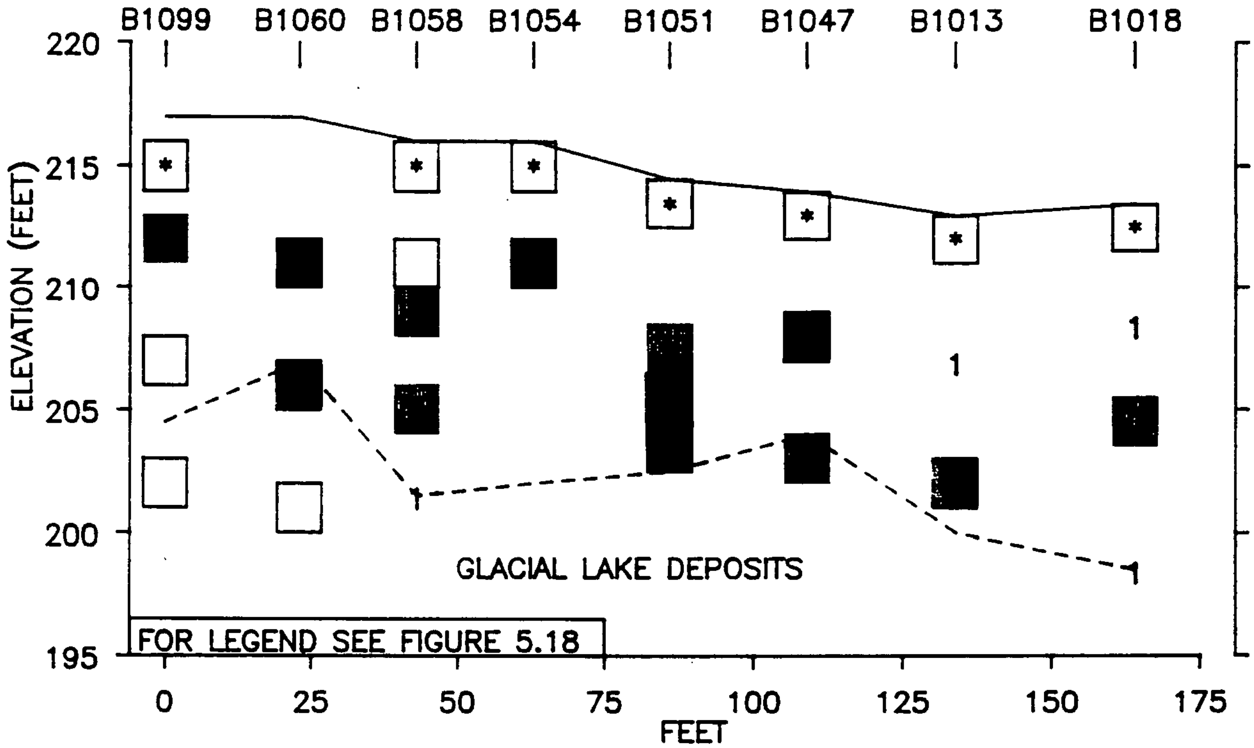
NOTE: THE SAMPLING LOCATIONS SHOWN ON THIS FIGURE ARE APPROXIMATE

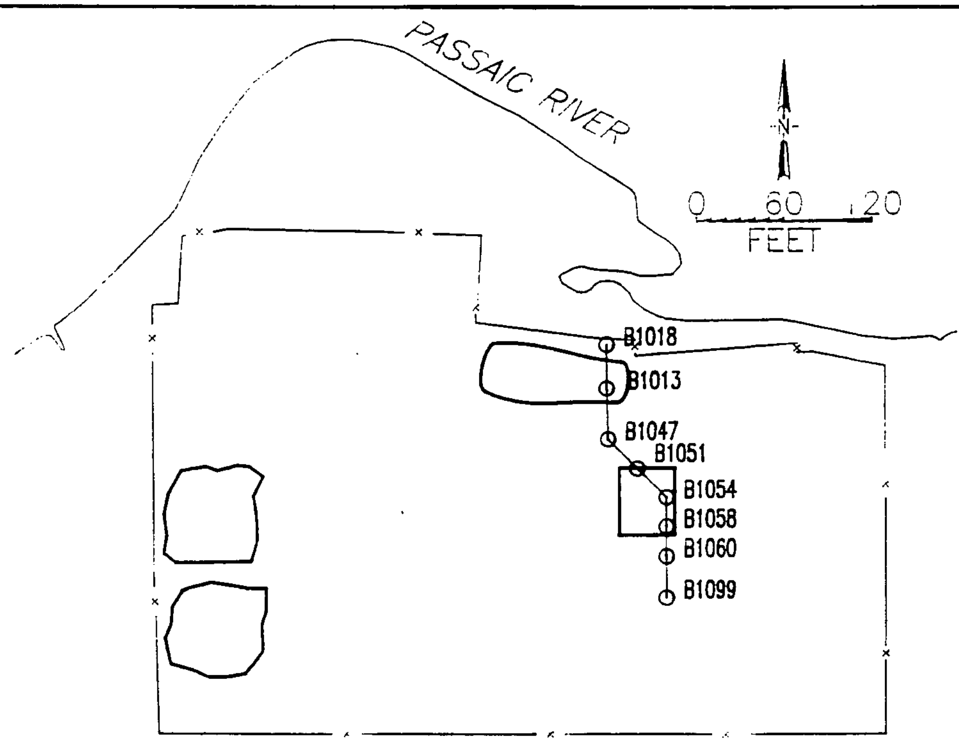


SCALE:1" = 60'

FIGURE 5.19

PHASE 2 SAMPLING SITES
TOTAL VOLATILES SECTION: B1099 TO B1018

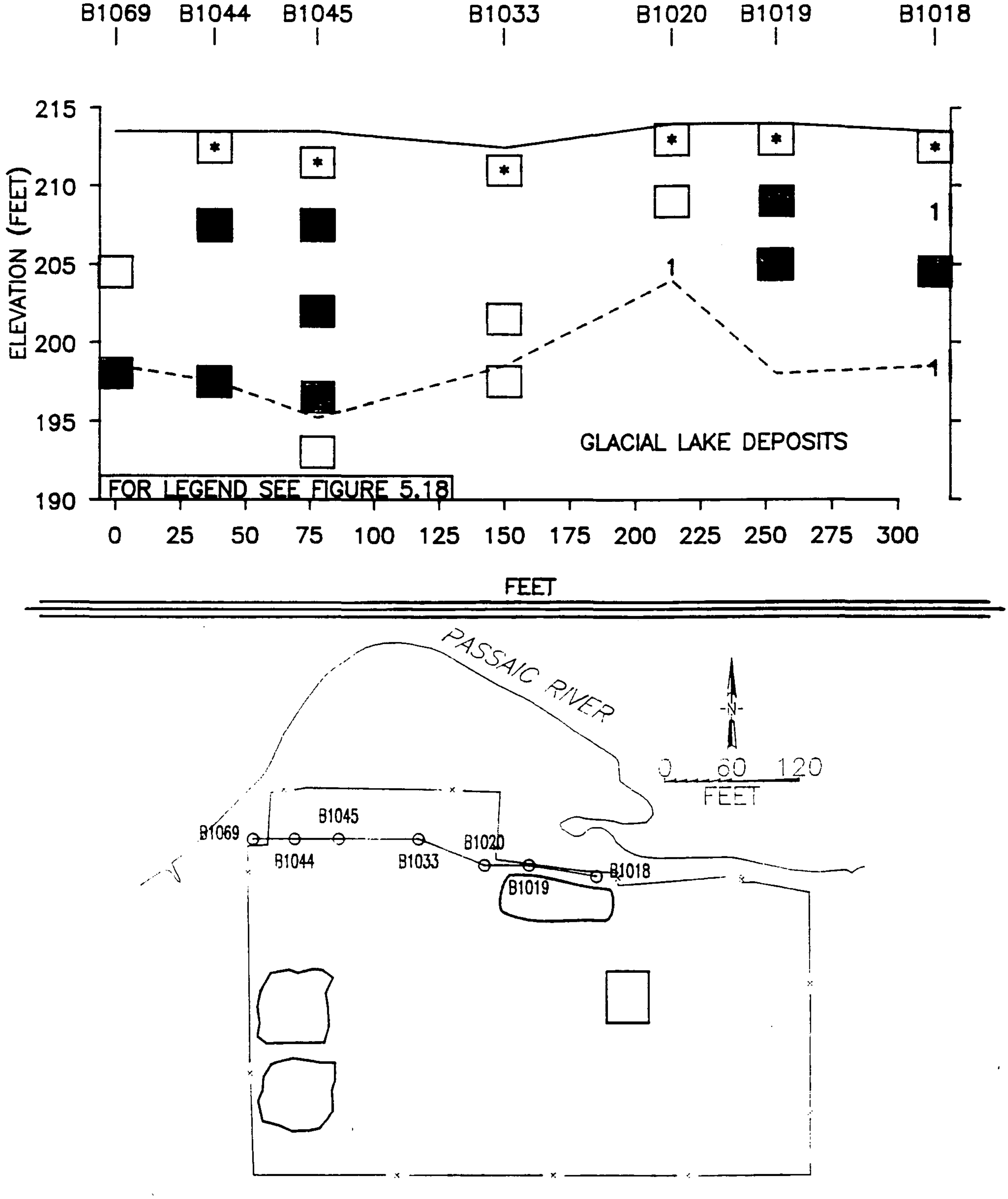




BH/B:BH5.19

FIGURE 5.20

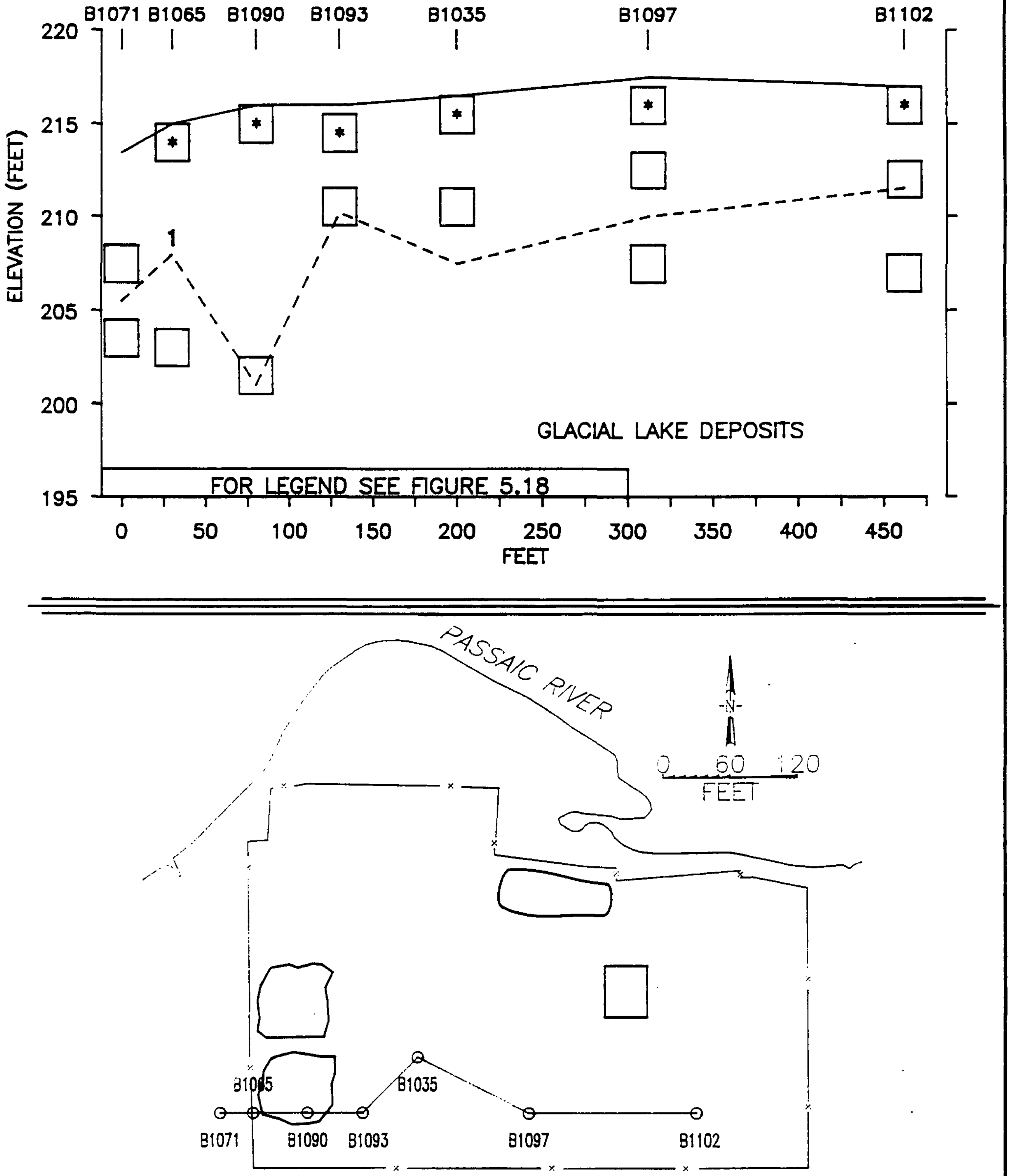
PHASE 2 SAMPLING SITES
TOTAL VOLATILES SECTION: B1069 TO B1018



9H/B:9H5.20

FIGURE 5.21

PHASE 2 SAMPLING SITES
TOTAL VOLATILES SECTION: B1071 TO B1102



BH/B:BH5.21

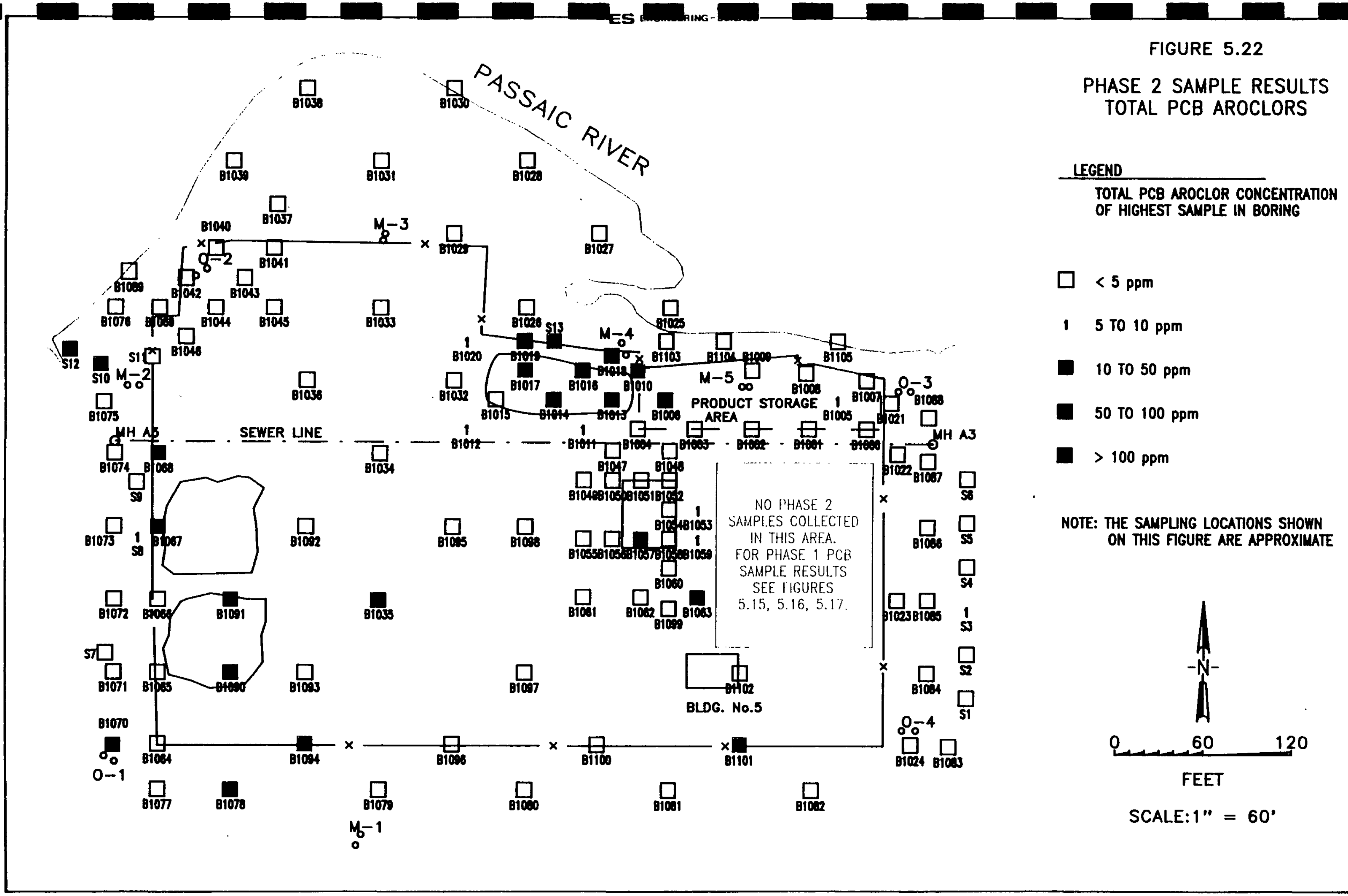
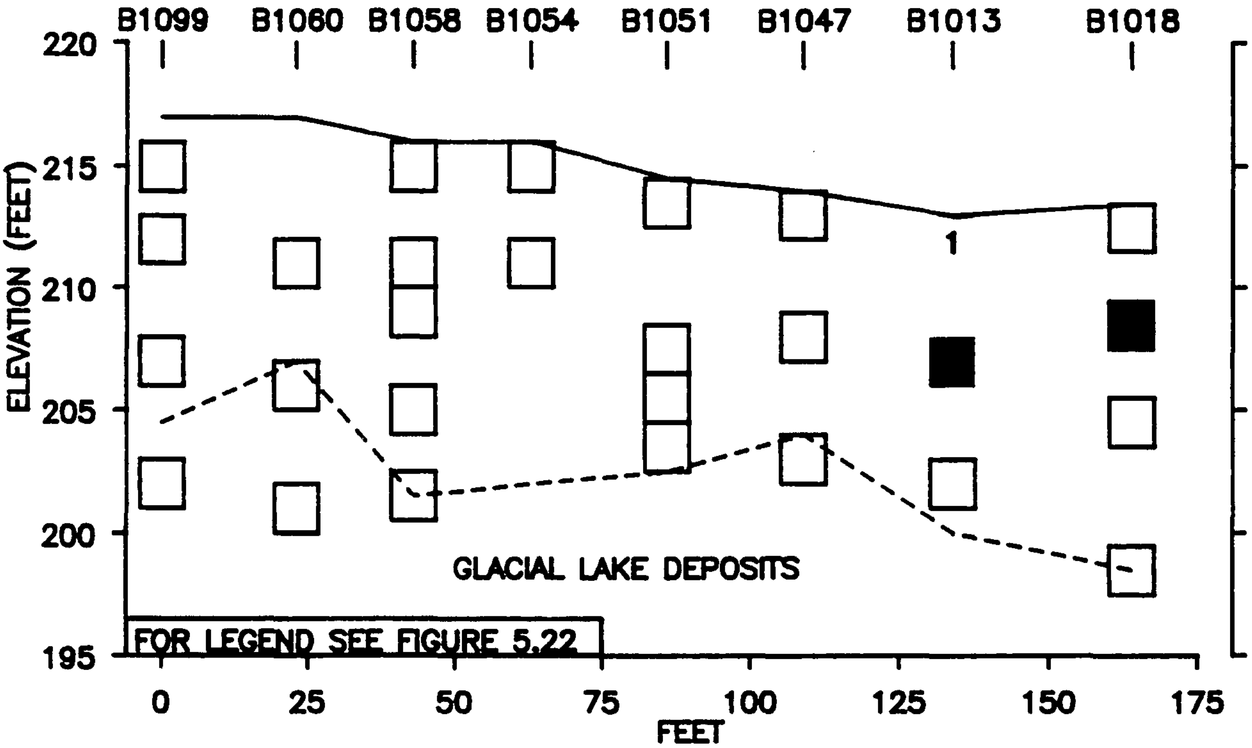
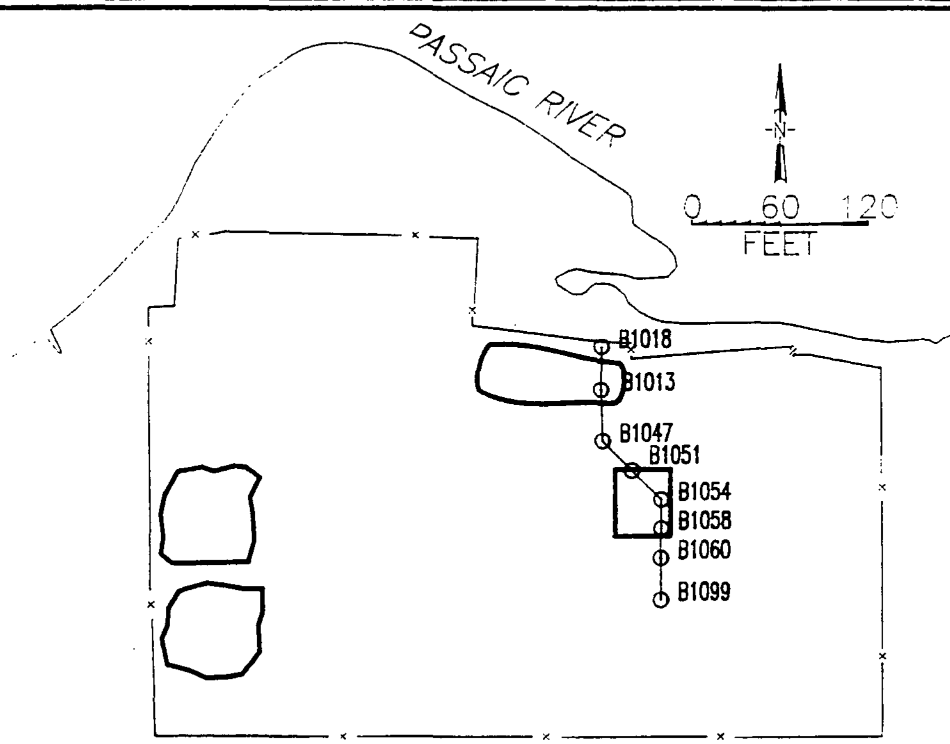


FIGURE 5.22
PHASE 2 SAMPLE RESULTS
TOTAL PCB AROCLORS
LEGEND
TOTAL PCB AROCLOR CONCENTRATION OF HIGHEST SAMPLE IN BORING
< 5 ppm
5 TO 10 ppm
10 TO 50 ppm
50 TO 100 ppm
> 100 ppm
NOTE: THE SAMPLING LOCATIONS SHOWN ON THIS FIGURE ARE APPROXIMATE
-N-
0 60 120
FEET
SCALE: 1" = 60'
PASSAIC RIVER
PRODUCT STORAGE AREA
SEWER LINE
MH A5
MH A3
NO PHASE 2 SAMPLES COLLECTED IN THIS AREA. FOR PHASE 1 PCB SAMPLE RESULTS SEE FIGURES 5.15, 5.16, 5.17.
BLDG. No.5
M-1
M-2
M-3
M-4
M-5
O-1
O-2
O-3
O-4
B1038
B1030
B1039
B1031
B1028
B1037
B1040
B1029
B1027
B1041
B1042
B1043
B1076
B1044
B1045
B1033
B1026
B1025
B1046
S13
B1020
B1019
B1103
B1104
B1009
B1105
S12
S10
S11
B1036
B1032
B1017
B1016
B1018
B1010
B1008
B1007
B1075
B1015
B1014
B1013
B1006
B1005
B1021
B1012
B1011
B1004
B1003
B1002
B1001
B1000
B1074
B1068
B1034
B1047
B1048
B1022
B1087
S9
B1049
B1050
B1051
B1052
S6
B1054
B1053
B1073
S8
B1067
B1092
B1095
B1098
B1055
B1057
B1058
B1059
B1086
S5
S4
B1060
B1072
B1066
B1091
B1035
B1061
B1062
B1063
B1099
B1023
B1085
S3
S7
B1071
B1065
B1090
B1093
B1097
B1102
B1084
S2
S1
B1070
B1064
B1094
B1096
B1100
B1101
B1024
B1083
B1077
B1078
B1079
B1080
B1081
B1082

FIGURE 5.23

PHASE 2 SAMPLING SITES
TOTAL PCB AROCLORS SECTION: B1099 TO B1018

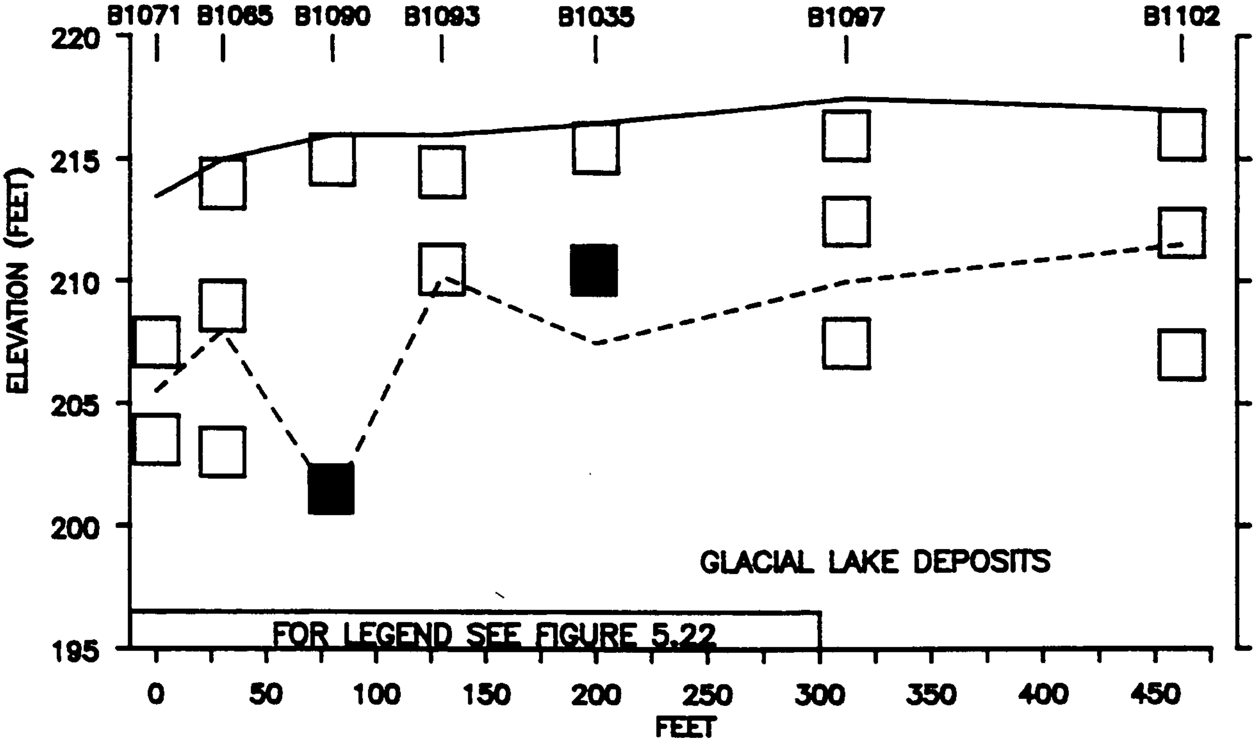


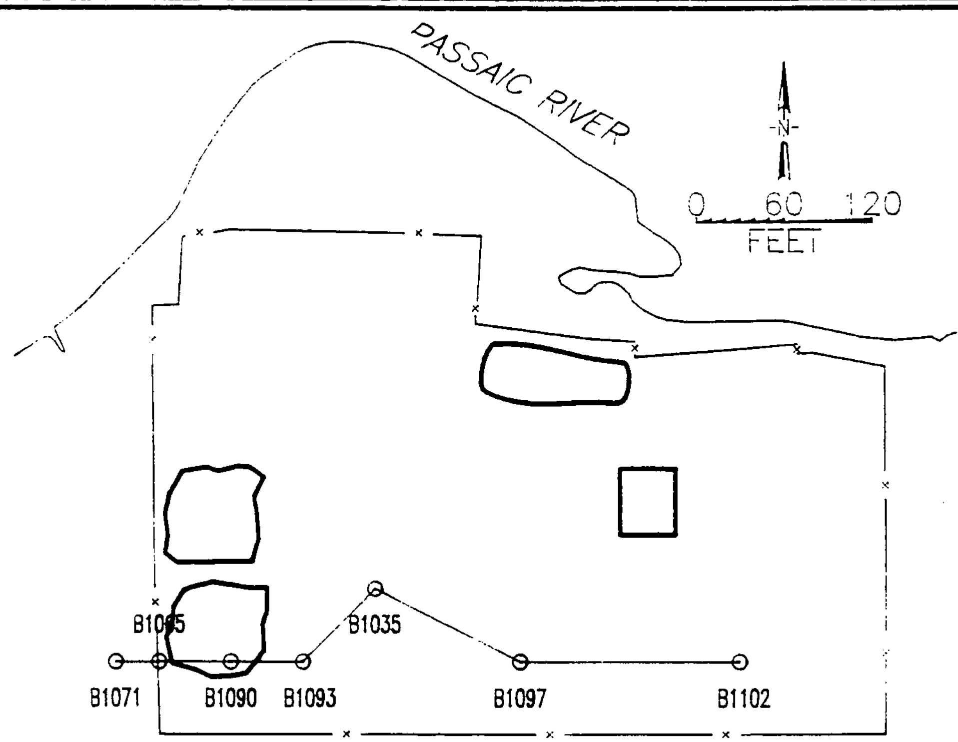


BH/B:BH5.23

FIGURE 5.24

PHASE 2 SAMPLING SITES
TOTAL PCB AROCLORS SECTION: B1071 TO B1102

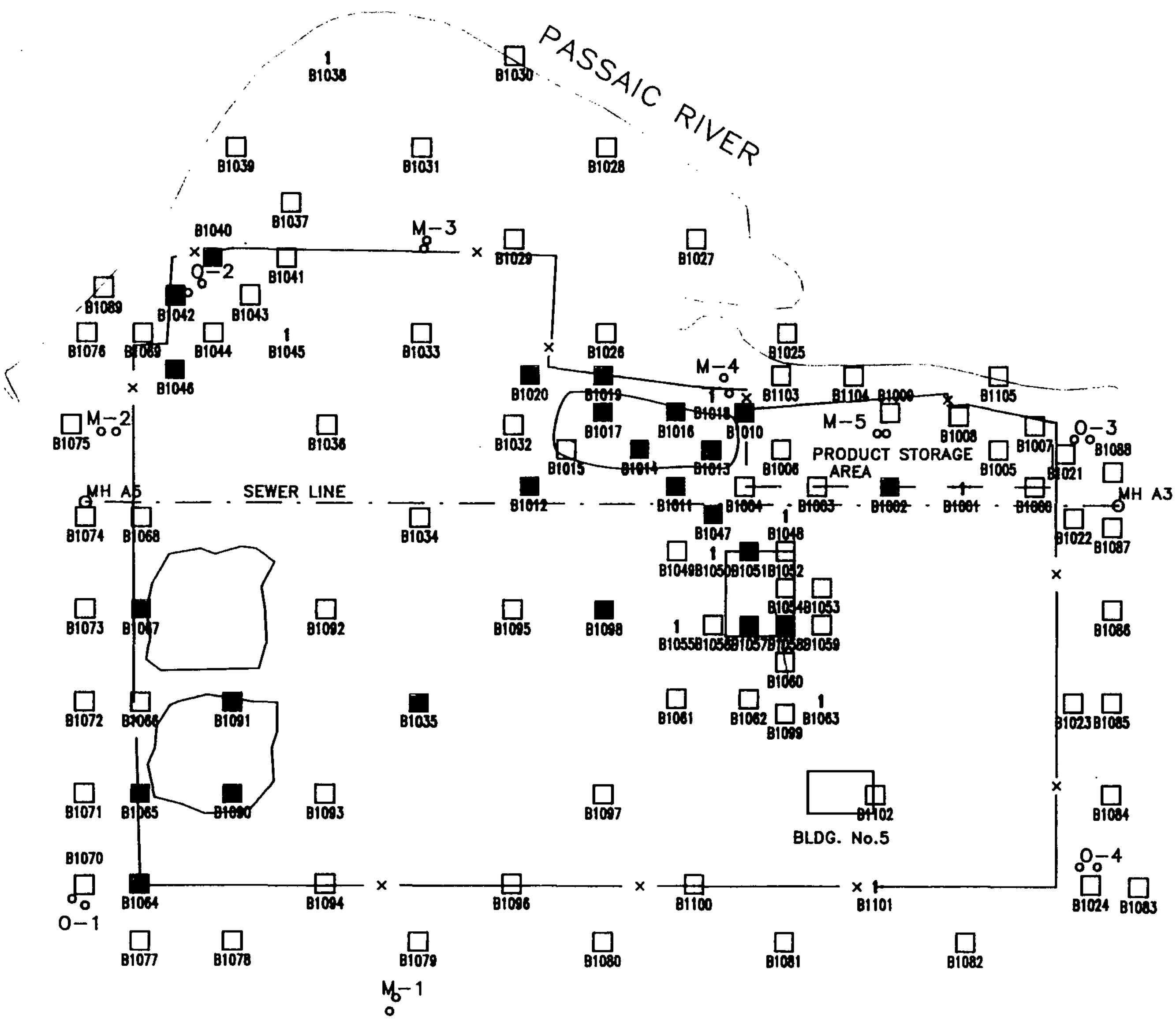




BH/B:BH5.24

FIGURE 5.25

PHASE 2 SAMPLE RESULTS
TOTAL PNAs, PHTHALATES AND
CHLORINATED BENZENES



LEGEND

TOTAL PNA/P/CB CONCENTRATION OF HIGHEST SAMPLE IN BORING

- □ < 5 ppm
- 1 5 TO 10 ppm
- ■ 10 TO 50 ppm
- ■ 50 TO 100 ppm
- ■ > 100 ppm

NOTE: THE SAMPLING LOCATIONS SHOWN ON THIS FIGURE ARE APPROXIMATE

N

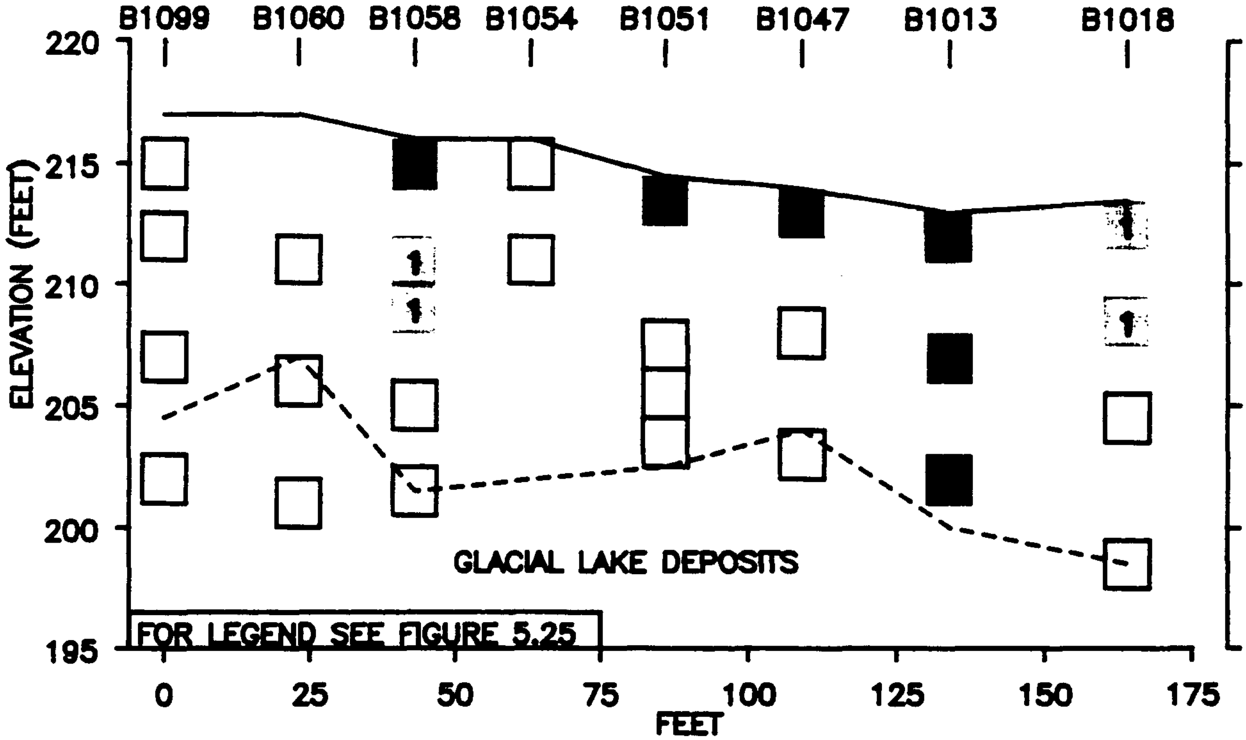
0 60 120

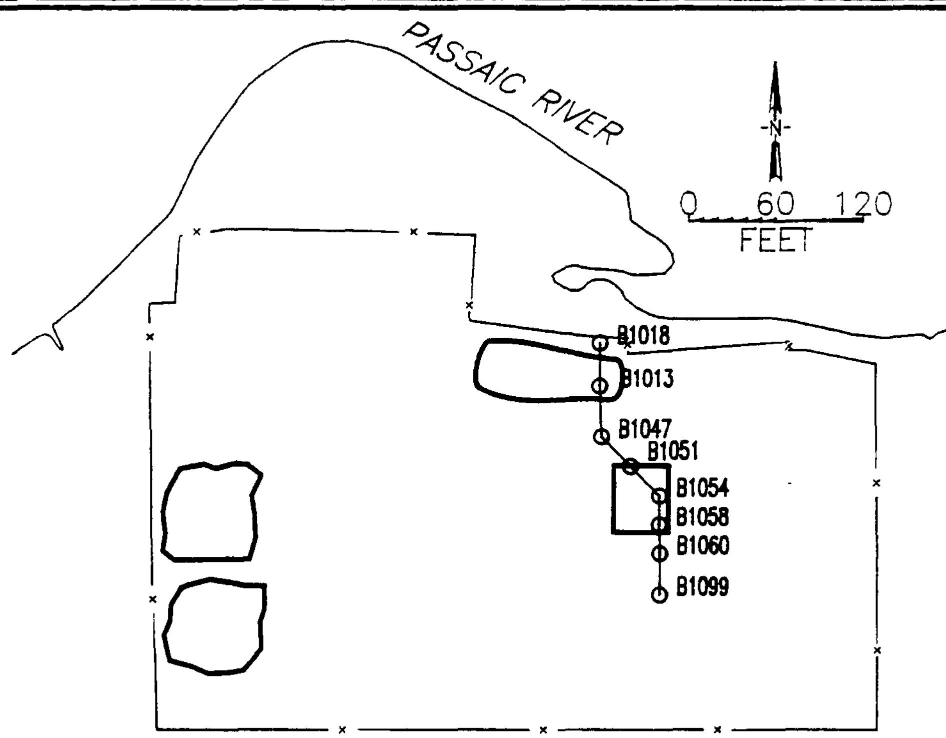
FEET

SCALE: 1" = 60'

FIGURE 5.26

PHASE 2 SAMPLING SITES
TOTAL PNA/P/CB* SECTION: B1099 TO B1018



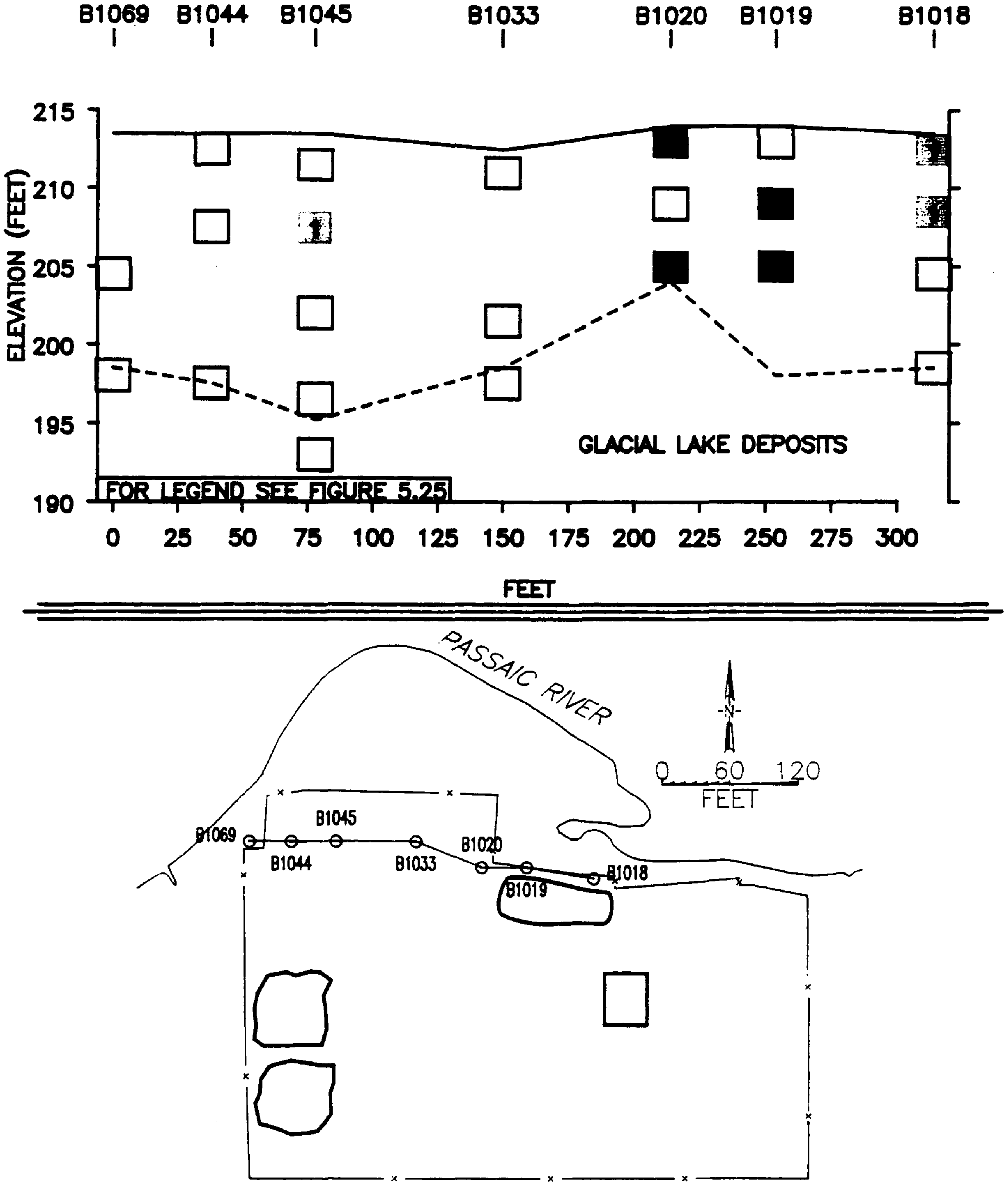


* PNAs, PHTHALATES AND CHLORINATED BENZENES

SH/B:SH5.26

FIGURE 5.27

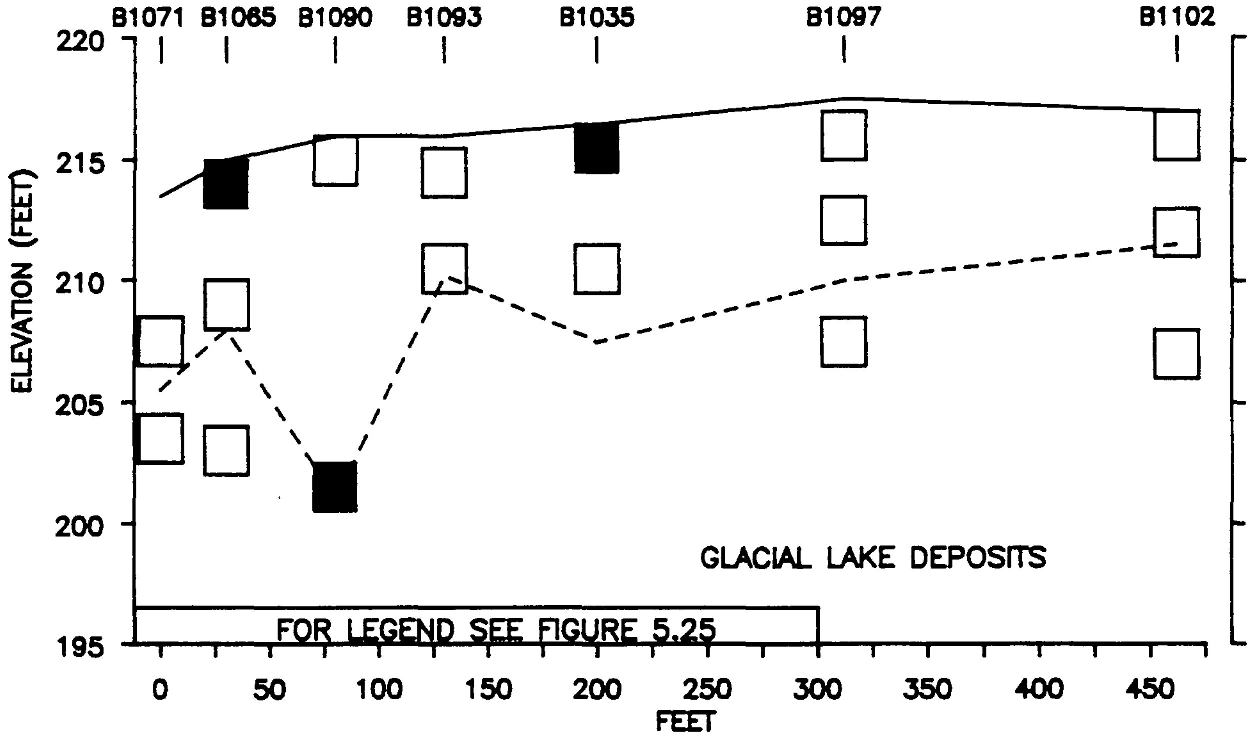
PHASE 2 SAMPLING SITES
TOTAL PNAs/P/CB* SECTION: B1069 TO B1018

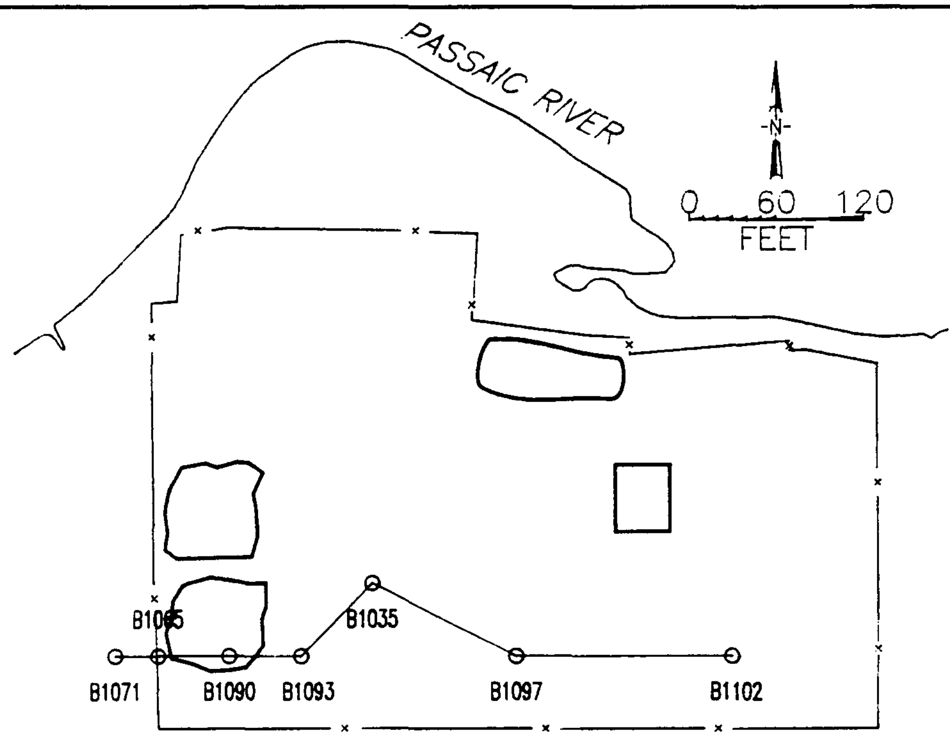


* PNAs, PHTHALATES AND CHLORINATED BENZENES

FIGURE 5.28

PHASE 2 SAMPLING SITES
TOTAL PNAs/P/CB* SECTION: B1071 TO B1102





* PNAs, PHTHALATES AND CHLORINATED BENZENES

CHAPTER 6

GROUNDWATER CONTAMINATION

During the Phase 1 and Phase 2 investigations a total of 26 groundwater monitoring wells were installed around the periphery of the site. Eleven of these wells were installed in the deep aquifer and 15 installed in the shallow aquifer. The locations of all monitoring wells (four-inch diameter), observation wells (two-inch diameter with bentonite seal) and piezometers (two-inch diameter without bentonite seal) are shown in Figure 2.1.

Groundwater quality samples were collected from all Phase 1 wells (M-1 through M-5 and 0-1 through 0-4) on November 15, 1983; March 14, 1984; August 23, 1984; and December 20, 1984. Samples were collected from all Phase 1 and Phase 2 wells (the above plus 0-5, 0-6, P-1 through P-3, M-6 and M-7) on November 18, 1985. Representatives from the NJDEP were present for the 1983 and 1985 sampling.

Parameters analyzed in samples collected from wells were one of two suites: priority pollutants plus 40 highest GC/MS peaks and conventional parameters or; priority pollutant volatiles, PCBs, Oil and Grease, Total Phenolics and Total Organic Carbon. The data for the 40 highest peaks scans may be found in Appendix Q.

The following summary of groundwater contamination uses the terms upgradient and downgradient to describe the various wells. The upgradient wells are as follows: (DEEP) M-6, M-7, M-1, 0-1, 0-4; (SHALLOW) M-1, 0-1, 0-4, M-7. The downgradient wells are as follows: (DEEP) M-2, O-2, M-3, M-4, M-5, 0-3; (SHALLOW) M-2, 0-6, P-2, P-3, M-3, O-2, M-4, M 5, P-1, O-3, O-5.

As described in Chapter 5 the terms low, moderate and high will be used to describe the concentration levels of contaminants found in well samples. Low means less than 10 ppm (mg/l); moderate means between 10 and 100 ppm (mg/l); high means greater than 100 ppm (mg/l).

The analysis of groundwater contamination will be broken down into two subsections; one dealing with shallow groundwater zone contamination and one with deep groundwater zone contamination. Each of the subsections will be further broken down into analysis of upgradient and downgradient sample results.

SHALLOW ZONE CONTAMINATION

Upgradient Wells (Shallow Zone)

Tables 6.1 through 6.5 list the analytical results obtained from shallow upgradient wells for the five sampling events (1983-1985). Examination of these tables reveals that low levels of 1,2-dichloroethane appear consistently in well 0-4S. Well M-1S consistently shows trichloroethene and tetrachloroethene at low to moderate levels. The latter compound also appears in well M-7S during the 1985 survey at low levels. The consistent presence of these compounds in the wells mentioned and the corroborating new evidence from well M-7S indicates that the source of these compounds is almost certainly off-site.

Downgradient Wells (Shallow Zone)

Tables 6.6 through 6.10 list the analytical results obtained from shallow downgradient wells for the five sampling events (1983-1985). Piezometers were not routinely used for monitoring groundwater quality. They were only sampled in one sampling round (November 18, 1985), and are included here only for completeness. Examination of these tables reveals that wells O-2, M-4, and M-5 are consistently contaminated with low to moderate levels of volatile and base/neutral compounds. O-2S also shows low levels of PCBs during three of the five events. Well M-2S intermittently shows low levels of benzene and, during the 1985 event, low levels of other volatiles. Well M-3 has intermittently shown low levels of one or another volatile compound (methylene chloride is considered a laboratory contaminant). P-1 showed moderate levels of volatiles in the 1985 survey. P-2 showed low levels of base neutrals during the 1985 survey, as did P-3. Wells O-5 and O-6 (on the sewer line outside the eastern and western fences, respectively) show moderate and low levels of volatiles, respectively. Well O-3 remained uncontaminated throughout all five surveys.

The above results indicate that the downgradient portion of the shallow aquifer is contaminated from site sources. The major areas of contamination appear to be around the Clear Water Lagoon (CWL), the Product Storage Area (PSA) and the Dredged Material Disposal Area (DMDA). This is consistent with the conclusions drawn about site contamination in Chapter 5. Figure 6.1 is a schematic representation of the areas of contamination in the shallow aquifer based upon well data and Phase 1 and Phase 2 soil borings and other samples. The outlines of the contaminant "plumes" shown in Figure 6.1 have been surmised and represent only volatiles and base/neutrals found in the shallow zone. PCB contamination is discussed in Chapter 5.

TABLE 6.1

SUMMARY OF WATER QUALITY ANALYSIS DATA
SHALLOW ZONE - UPGRADIENT WELLS
NOVEMBER 15, 1983
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells O-1	M-1	O-4
Volatile Compounds				
1,2-dichloroethane	15V	-	-	.02
Methylene chloride	22V	-	.01	.01
Tetrachloroethene	24V	-	.36	-
Metals and Cyanide				
Chromium	5M	.06	-	.02
Copper	6M	.30	.01	.02
Lead	7M	.09	-	-
Mercury	8M	<.01	-	-
Nickel	9M	.11	.01	.02
Zinc	13M	.60	.03	.03
Cyanide, total	14M	.04	.03	-
Conventional Analysis Data				
Barium		1.3	.07	.16
Iron		9.3	6.0	10.0
pH, S.U.		7.0	7.0	7.4
Total Organic Carbon (TOC)		40	5.5	7.1
Total Dissolved Solids (TDS)		1,850	480	846
Specific Conductance, umhos/cm		2,450	563	948

Note: Samples were analyzed for priority pollutants and conventional parameters. A compound is reported here only if it was above analytical detection limits in one or more samples.

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TABLE 6.2

SUMMARY OF WATER QUALITY
SHALLOW ZONE - UPGRADIENT WELLS
MARCH 14, 1984
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells O-1	M-1	O-4
Volatile Compounds				
1,2-Dichloroethane	15V	-	-	.05
Ethylbenzene	19V	.02	-	-
1,1,2,2-Tetrachloroethane	23V	.01	-	-
Tetrachloroethene	24V	-	.47	-
Trichloroethene	29V	-	.01	-
Pesticides				
PCB-1248	22P	.02	-	-
Conventional Analysis Data				
Oil and Grease		-	-	-
Total Organic Carbon (TOC)		21	1.4	17

Note: Samples were analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon. A compound is reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00036

TABLE 6.3

SUMMARY OF WATER QUALITY
SHALLOW ZONE - UPGRADIENT WELLS
AUGUST 23, 1984
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells O-1	M-1	O-4
Volatile Compounds				
1,2 Dichloroethane	15V	-	-	.06
Tetrachloroethene	24V	-	.64	-
Trichloroethene	29V	-	.01	-
Conventional Analysis Data				
Oil and Grease		-	2	25
Total Organic Carbon (TOC)		19	4.9	7.7

Note: Samples were analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon. A compound is reported here only if it was above analytical detection limits in one or more samples.

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TABLE 6.4

SUMMARY OF WATER QUALITY
SHALLOW ZONE - UPGRADIENT WELLS
DECEMBER 20, 1984
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells O-1	M-1	O-4
Volatile Compounds				
1,2-Dichloroethane	15V	-	-	0.03
Ethylbenzene	19V	-	-	-
1,1,2,2-Tetrachloroethane	23V	-	-	-
Tetrachloroethene	24V	-	.66	-
Trichloroethene	29V	-	.01	-
Conventional Analysis Data				
Oil and Grease		-	-	24
Total Organic Carbon (TOC)		28	4.1	5.8

Note: Samples were analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon. A compound is reported here only if it was above analytical detection limits in one or more samples.

TABLE 6.5

SUMMARY OF WATER QUALITY

SHALLOW ZONE - UPGRADIENT WELLS

NOVEMBER 18, 1985

(ALL RESULTS IN MG/L)

Parameter ES Sample Number	Observation/Monitoring Well O-1(2) (5342)	 M-1(2) (5340)	 O-4(2) (5318)	 M-7(1) (5338)
Volatile Compounds				
1,1,2,2-Trichloroethane	-	-	-	-
Tetrachloroethene	-	7.40	-	.16
Trichloroethene	-	.02	-	-
1,2-Dichloroethane	-	-	.02	-
Chloroform	-	-	-	-
Base-Neutral/Acid Compounds				
Di-n-butyl phthalate	*	*	*	-
Bis(2-ethylhexyl)phthalate	*	*	*	.05
Metals				
Arsenic	*	*	*	-
Chromium	*	*	*	.04
Copper	*	*	*	.05
Lead	*	*	*	.03
Mercury	*	*	*	-
Nickel	*	*	*	.03
Thallium	*	*	*	.01
Zinc	*	*	*	.26
Total Phenolics	.03	-	-	.09
Conventional Parameters				
Oil & Grease	-	1.	-	2.
Total Organic Carbon (TOC)	19.	4.0	3.2	8.9
Conductance (umhos/cm)	-	*	*	330.
pH (s.u.)	-	*	*	6.7
Total Dissolved Solids (TDS)	-	*	*	180.

* Analysis not requested.

Note: 1 Samples were analyzed for priority pollutants and conventional parameters.

2 Samples were analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon.

A compound was reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00036

TABLE 6.6

SUMMARY OF WATER QUALITY ANALYSIS DATA
SHALLOW ZONE - DOWNGRADIENT WELLS
NOVEMBER 15, 1983
(ALL RESULTS IN MG/L)

	Observation/Monitoring Wells					
Compound/Parameter	M-2	O-2	M-3	M-4	M-5	O-3
Volatile Compounds						
Benzene	-	.64	-	.72	.24	-
Chlorobenzene	-	2.8	-	-	1.5	-
Chloroform	-	-	-	-	.13	-
1,2-Dichloroethane	-	-	-	-	.08	-
Ethylbenzene	-	22.	-	6.4	-	-
Methyl chloride	-	-	.04	-	-	-
Methylene chloride	-	.11	-	-	.32	-
Toluene	-	3.1	-	.94	1.9	-
Trans-1,2-dichloroethene	-	.32	-	-	-	-
Base/Neutral Compounds						
1,4-Dichlorobenzene	-	.06	-	-	-	-
Di-n-butyl phthalate	-	-	-	.02	-	-
Naphthalene	-	.08	-	.01	-	-
1,2 Dichlorobenzene	-	.39	-	-	-	-
Metals, Cyanide and Phenols						
Arsenic	-	.01	-	<.01	-	-
Chromium	-	.04	.02	-	.04	.03
Copper	.03	.11	.04	.03	.25	.07
Mercury	-	-	-	<.01	-	-
Nickel	-	.04	.03	.02	.04	.05
Zinc	.01	.24	.12	.03	.09	.12
Cyanide, total	.03	-	-	.03	.03	-
Phenolics, total	-	.11	-	9.0	36.	-
Conventional Analysis Data						
Barium	.09	.56	.36	.20	.94	.35
Iron	3.6	25.	39.	6.6	25.	29.
pH, S.U.	7.6	6.6	6.6	7.6	7.0	7.8
Oil and Grease	3.6	8	10	32	120	6
Total Organic Carbon (TOC)	28	181	33	310	2,410	29
Total Dissolved Solids (TDS)	618	1,520	1,820	1,980	5,240	1,710
Specific Conductance, um/cm	917	1,720	1,750	2,480	3,550	962

Note: Samples were analyzed for priority pollutants and conventional parameters. A compound is reported here only if it was above analytical detection limits in one or more samples.

TABLE 6.7

SUMMARY OF WATER QUALITY ANALYSIS DATA
SHALLOW ZONE - DOWNGRADIENT WELLS
MARCH 14, 1984
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells M-2	O-2	M-3	M-4	M-5	O-3
Volatile Compounds							
Benzene	3V	-	.71	-	-	-	-
Chlorobenzene	7V	-	2.3	-	342.*	1.6	-
Chloroform	11V	-	.04	-	-	.35	-
1,2-Dichloroethane	15V	-	.15	-	-	.15	-
Ethylbenzene	19V	-	15.4	-	2230.*	3.2	-
Methylene chloride	22V	.01	.10	-	320.*	.35	-
1,1,2,2-Tetrachloroethane	23V	-	.47	-	-	-	-
Toluene	25V	-	4.2	-	766.*	2.6	-
Trans-1,2-dichloroethene	26V	-	.46	-	-	-	-
Trichloroethene	29V	-	.20	.01	600.*	.01	-
Vinyl chloride	31V	-	.02	-	-	-	-
Phenols							
Phenolics, Total	15M	-	.21	.15	.11	54.	-
Conventional Analysis Data							
Oil and Grease		-	-	-	50	25	-
Total Organic Carbon (TOC)		41.5	191	50	430	2,300	8.2

Note: Samples analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon. A compound is reported here only if it was above analytical detection limits in one or more sample.

* Compounds reported in ug/kg by laboratory (E.T.C.). Units in this table are in mg/kg for this sample.

MAC/SY027/00037

TABLE 6.8

SUMMARY OF WATER QUALITY ANALYSIS DATA
SHALLOW ZONE - DOWNGRADIENT WELLS
AUGUST 23, 1984
(ALL RESULTS IN MG/L)

Parameters	NPDES Number	Observation/Monitoring Wells					
		M-2	O-2	M-3	M-4	M-5	O-3
Volatile Compounds							
Benzene	3V	.03	-	-	1.5	.35	-
Chlorobenzene	7V	-	-	-	-	2.0	-
Chloroform	11V	-	-	-	-	.21	-
1,2 Dichloroethane	15V	-	-	-	-	.15	-
Ethylbenzene	19V	-	26.	-	13.	18.	-
Methylene Chloride	22V	-	41.	.02	1.4	.41	-
Toluene	25V	-	-	-	3.2	3.9	-
Pesticide Compounds							
PCB-1248	18P	-	.20	-	-	-	-
Conventional Analysis Data							
Oil and Grease		-	5.00	-	33	30	11
Total Organic Carbon (TOC)		37	350	85	490	1,500	8.5
Total Phenolics		0.95	0.42	-	13	25	-

Note: Samples analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon. A compound is reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00037

TABLE 6.9

SUMMARY OF WATER QUALITY ANALYSIS DATA
SHALLOW ZONE - DOWNGRADIENT WELLS
DECEMBER 20, 1984
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells					
		M-2	O-2	M-3	M-4	M-5	O-3
Volatile Compounds							
Benzene	3V	.22	-	-	1.1	-	-
Chlorobenzene	7V	-	-	-	-	2.8	-
Ethylbenzene	19V	-	113.	-	9.0	19.3	-
Methylene Chloride	22V	-	11.	-	-	1.2	-
Toluene	25V	-	-	-	1.8	5.1	-
Pesticide Compounds							
PCB-1248	22P	-	.05	-	-	-	-
Conventional Analysis Data							
Oil and Grease		-	-	1	170	31	-
Total Organic Carbon (TOC)		31	89	53	320	1,900	7.4
Total Phenolics		-	0.41	0.13	9.1	34	0.17

Note: Samples analyzed for priority pollutant volatile compounds, PCBS, oil and grease, total phenolic compounds, and total organic carbon. A compound is reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00037

TABLE 6.10
SUMMARY OF WATER QUALITY ANALYSIS DATA
SHALLOW ZONE - DOWNGRADIENT WELLS
NOVEMBER 18, 1985
(ALL RESULTS IN MG/L)

Compound/Parameter	Observation/Monitoring Well										
	O-6 (1)	M-2 (2)	O-2 (2)	P-3 (1)	M-3 (2)	P-2 (1)	M-4 (2)	M-5 (2)	P-1 (1)	O-3 (2)	O-5 (1)
ES Sample Number	(5333)	(5331)	(5335)	(5330)	(5328)	(5327)	(5326)	(5323)	(5322)	(5320)	(5319)
Volatile Compounds											
Chlorobenzene	.03	.02	-	-	-	-	-	2.3	1.1	-	26.
Toluene	-	-	1.9	-	-	-	2.6	4.3	-	-	.32
Acetone	.14	-	-	-	-	-	-	270.	-	-	17.
Chloroform	-	-	1.3	-	-	-	-	.19	-	-	1.2
Ethylbenzene	.04	.02	13.	-	-	-	11.	23.	3.3	-	-
Total Xylenes	.04	.03	75.	-	-	.01	63.	194.	26.	-	6.3
1,2-Dichloroethane	-	-	-	-	-	-	-	.21	-	-	-
Benzene	<.01	.02	.26	-	-	-	1.2	.28	-	-	4.4
4-Methyl-2-pentanone	.04	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	.25	-	-	-	-	-	-	-	-
Base-Neutral Compounds											
Di-n-butyl phthalate	-	*	*	-	*	-	*	*	-	*	-
bis(2-ethylhexyl)phthalate	-	*	*	.08	*	.12	*	*	-	*	-
Di-n-octyl phthalate	-	*	*	.01	*	.03	*	*	-	*	.01
Phenol	-	*	*	-	*	-	*	*	-	*	.49
1,4-Dichlorobenzene	-	*	*	-	*	-	*	*	-	*	.36
2-Chlorophenol	-	*	*	-	*	-	*	*	-	*	.17
Butyl benzyl phthalate	-	*	*	-	*	-	*	*	-	*	-
Pesticides											
Total PCB arochlors	-	-	.10	-	-	-	-	<.01	-	<.01	-
Metals, Cyanide, and Phenolics											
Arsenic	.07	*	*	.06	*	.01	*	*	.10	*	.05
Beryllium	.01	*	*	.01	*	-	*	*	-	*	-
Cadmium	-	*	*	.01	*	.01	*	*	-	*	-
Chromium	.19	*	*	.44	*	.04	*	*	.17	*	.09
Copper	.21	*	*	.42	*	.10	*	*	.12	*	.13
Lead	.13	*	*	.09	*	.02	*	*	.06	*	.06
Mercury	-	*	*	-	*	-	*	*	.01	*	-
Nickel	.18	*	*	.49	*	.50	*	*	.09	*	.16
Silver	-	*	*	-	*	-	*	*	-	*	-
Thallium	-	*	*	-	*	.01	*	*	-	*	-
Zinc	1.4	*	*	.81	*	.20	*	*	.78	*	.45
Total Cyanide	-	*	*	-	*	-	*	*	-	*	.01
Total Phenolics	.06	.06	.06	.05	.50	.29	7.2	20.	.15	.04	1.6
Conventional Parameters											
pH (s. u.)	7.6	*	*	6.3	*	6.6	*	*	6.5	*	6.9
Oil and Grease	1	2	22	1	1	3	20	44	12	-	5
Total Organic Carbon (TOC)	82.	19.	70.	172.	96.	40.	320.	1780.	116.	8.5	265.
Total Dissolved Solids (TDS)	870.	*	*	470.	*	820.	*	*	580.	*	1080.
Specific Conductives (umhos/cm)	1400.	*	*	590.	*	1410.	*	*	1020.	*	1630.

* Analysis not requested.

Note: 1 Samples were analyzed for priority pollutants and conventional parameters.

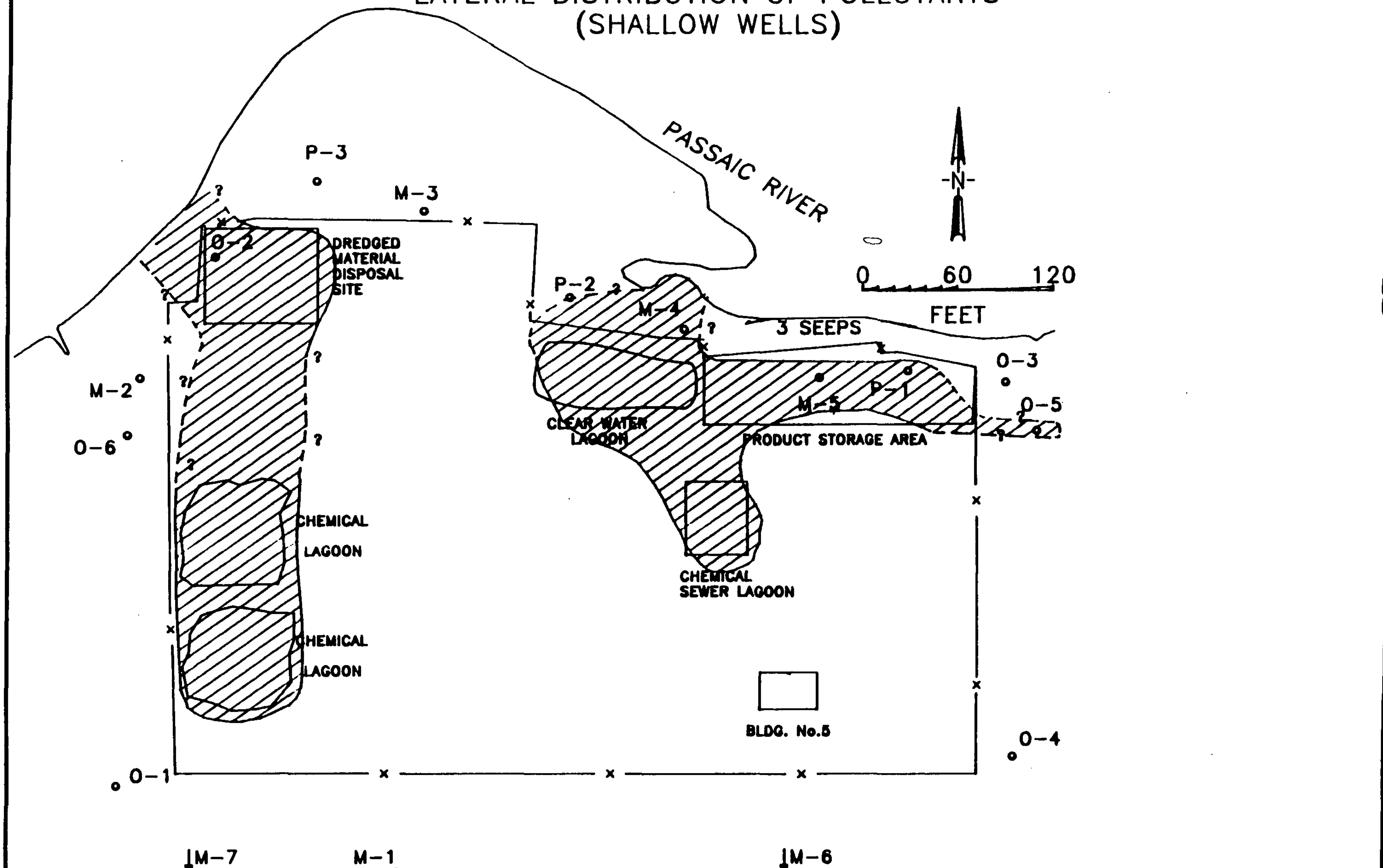
2 Samples were analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon.

A compound was reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00036

FIGURE 6.1

LATERAL DISTRIBUTION OF POLLUTANTS
(SHALLOW WELLS)



ES ENGINEERING-SCIENCE

BM/B:BH6.1

6-12

DEEP ZONE CONTAMINATION

Upgradient Wells (Deep Zone)

Tables 6.11 through 6.17 list the analytical results obtained from deep upgradient wells for the seven sampling events (1983-1986). Examination of these tables reveals that wells O-1D, M-1D and O-4D consistently showed low levels of trichloroethene and tetrachloroethene (both volatiles). (Methylene chloride is considered a laboratory contaminant.) Well M-7D showed low levels of the latter compound during the 1985 and 1986 events. Well M-6 showed only low levels of phthalates which are present in 1985 and 1986 samples. The consistent presence of the volatile compounds in the upgradient wells O-1, M-1, and O-4 and the corroborating new evidence from well M-7D indicates that the source of these compounds is almost certainly off-site.

Downgradient Wells (Deep Zone)

Tables 6.18 through 6.24 list the analytical results obtained from deep downgradient wells for the seven sampling events. Examination of these tables reveals that three of the deep zone downgradient wells have not shown contaminants during any of the surveys. The following volatile compounds have been detected in the deep groundwater samples collected at the site: chlorobenzene; ethylbenzene; methylene chloride; toluene; acetone; 1,2 dichloroethane; trans-1,2-dichloroethene; trichloroethene; and tetrachloroethene. Two of these compounds (chlorobenzene and toluene) were detected in only one downgradient well during the earliest of four sampling events. Ethylbenzene was detected in two downgradient wells only during the initial sampling event. The presence of these compounds in the samples is believed attributable to cross-contamination during sampling, since they were not detected during later sampling events. The sporadic appearance of acetone in the November 1985 sampling only was probably due to its introduction during incomplete decontamination of well bailers at that time. Methylene chloride was detected in several upgradient and downgradient wells, and is believed to be a laboratory contaminant. Trichloroethene was detected upgradient in concentrations greater than present in the downgradient wells. The remaining volatile organic compounds were detected in various upgradient wells but were not found downgradient. Taken together, these data do not indicate significant contamination of the deep aquifer which can be attributable to the site.

TABLE 6.11

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - UPGRADIENT WELLS
NOVEMBER 15, 1983
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells		
		O-1	M-1	O-4
Volatile Compounds				
Methylene chloride	22V	-	-	.01
Tetrachloroethene	24V	.12	-	-
Trans-1,2-dichloroethene	26V	.06	-	-
Trichloroethene	29V	.06	-	.18
Metals and Cyanide				
Arsenic	2M	-	.01	-
Chromium	5M	.06	.05	.02
Copper	6M	.30	.21	.12
Lead	7M	.09	.06	-
Mercury	8M	<.01	-	-
Nickel	9M	.11	.08	.06
Selenium	10M	-	.01	-
Zinc	13M	.60	.56	.17
Cyanide, total	14M	.04	.03	-
Conventional Analysis Data				
Barium		1.1	.95	.54
Iron		44.	62.	19.
pH (s.u.)		7.6	7.8	7.2
Total organic carbon (TOC)		8.9	19	5.9
Total dissolved solids (TDS)		512	472	364
Specific conductance (umhos/cm)		445	531	451

Note: Samples analyzed for priority pollutants and conventional parameters. A compound was reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00036

TABLE 6.12

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - UPGRADIENT WELLS
MARCH 14, 1984
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells O-1	M-1	O-4
Volatile Compounds				
Methylene chloride	22V	-	.01	-
Trichloroethene	29V	.02	-	.02
Tetrachloroethene	24V	.04	-	-
Conventional Analysis Data				
Oil and Grease		-	-	-
Total Organic Carbon (TOC)		4	7	23

Note: Samples analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon. A compound was reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00036

TABLE 6.13

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - UPGRADIENT WELLS
AUGUST 23, 1984
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells O-1	M-1	O-4
Volatile Compounds				
Methylene Chloride	22V	-	-	.02
Tetrachloroethene	24V	.12	.01	-
Trans-1,2-dichloroethene	26V	.03	-	-
Trichloroethene	29V	.03	-	-
Conventional Analysis Data				
Oil and Grease		10	9	-
Total Organic Carbon (TOC)		4.3	4.9	5.2

Note: Samples analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon. A compound was reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00036

TABLE 6.14

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - UPGRADIENT WELLS
DECEMBER 20, 1984
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells O-1	M-1	O-4
Volatile Compounds				
Methylene Chloride	22V	-	.01	-
Tetrachloroethene	24V	.11	.01	-
Trans-1,2-dichloroethene	26V	.02	-	-
Trichloroethene	29V	.02	-	.04
Conventional Analysis Data				
Oil and Grease		1	-	-
Total Organic Carbon (TOC)		5.2	3.1	3.0
Total Phenolics		.09	-	-

Note: Samples analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon. A compound was reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00036

TABLE 6.15
SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - UPGRADIENT WELLS
NOVEMBER 18, 1985
(ALL RESULTS IN MG/L)

Parameter	Observation/Monitoring Well				
Parameter ES Sample Number	O-4 (2) (5317)	M-6 (1) (5336)	M-1 (2) (5339)	M-7 (1) (5337)	O-1 (2) (5341)
Volatile Compounds					
Trans-1,2-dichloroethene	.01	-	-	-	.03
1,2-Dichloroethane	.01	-	-	-	-
Trichloroethene	.08	-	-	-	.02
Tetrachloroethene	-	-	.02	.05	.09
Base/Neutral Compounds					
Di-n-butyl phthalate	*	-	*	-	*
Bis(2-ethylhexyl)phthalate	*	.03	*	.05	*
Di-n-octyl phthalate	*	.01	*	-	*
Metals, Cyanide, and Phenolics					
Cadmium	*	-	*	-	*
Chromium	*	.01	*	.04	*
Copper	*	.01	*	.07	*
Lead	*	.01	*	.26	*
Nickel	*	.03	*	.04	*
Thallium	*	-	*	.01	*
Zinc	*	.28	*	.28	*
Total Phenolics	.02	.11	.27	.24	.30
Conventional Parameters					
Oil and Grease	-	9	2	1	-
Total Organic Carbon (TOC)	3.2	41.	11.	5.4	1.3
Conductance (umhos/cm)	*	580.	*	260.	*
pH (s. u.)	*	6.1	*	6.2	*
Total Dissolved Solids (TDS)	*	310.	*	300.	*

* Analysis not requested.

Note: 1 Samples were analyzed for priority pollutants and conventional parameters.

2 Samples were analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon.

A compound was reported here only if it was above analytical detection limits in one or more samples.

TABLE 6.16

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - UPGRADIENT WELLS
JUNE 23, 1986
(ALL RESULTS IN MG/L)

Parameter	Observation/Monitoring Well				
	O-4	M-6	M-1	M-7	O-1
ES Sample Number	(5358)	(5360)	(5363)	(5361)	(5362)
Volatile Compounds					
Trans-1,2-dichloroethene	.004	-	.003	-	.022
Trichloroethene	.048	-	-	.005	.027
Tetrachloroethene	-	-	.014	.180	.220
Base/Neutral Compounds					
Di-n-butyl phthalate	-	-	.001	-	-
Bis (2-ethylhexyl) phthalate	-	.017	-	-	-
Metals, Cyanide, and Phenolics					
Arsenic	.002	.003	.003	.002	.002
Beryllium	-	-	.003	-	-
Cadmium	-	.001	-	-	-
Total Chromium	-	-	-	.005	.002
Copper	.006	.008	.013	.007	.007
Lead	-	.012	.008	.009	.008
Nickel	-	-	-	.037	-
Zinc	.02	.06	.01	.02	.01

Note: Samples analyzed for priority pollutant volatiles, base/neutrals, and metals. A compound is reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00038

TABLE 6.17

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - UPGRADIENT WELLS
SEPTEMBER 8, 1986
(ALL RESULTS IN MG/L)

Parameter	Observation/Monitoring Well				
	O-4	M-6	M-1	M-7	O-1
ES Sample Number	(5358)	(5360)	(5363)	(5361)	(5362)
Volatile Compounds					
Methylene chloride	-	.014[A]	.015[A]	.014[A]	.016[A]
Trans-1,2-dichloroethene	.015	-	.003	-	.021
Trichloroethene	.190	-	-	-	.021
Tetrachloroethene	-	-	.017	.052	.130
Metals, Cyanide, and Phenolics					
Cadmium	-	.0007	-	-	-
Copper	-	-	-	.006	-
Lead	.002	.002	.002	.003	.002
Nickel	.005	.037	.005	.006	.007
Zinc	.011	.051	.006	.006	-

A Reported as probable laboratory contamination.

Note: Samples analyzed for priority pollutant volatiles, base/neutrals, and metals. A compound is reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00038

TABLE 6.18

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - DOWNGRADIENT WELLS
NOVEMBER 15, 1983
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells M-2	O-2	M-3	M-4	M-5	O-3
Volatile Compounds							
Chlorobenzene	7V	-	-	-	-	.07	-
Ethylbenzene	19V	-	-	-	-	.35	-
Toluene	25V	-	-	-	-	.12	-
Base/Neutral Compounds							
Bis(2-ethylhexyl)phthalate	13B	.02	-	.02	-	-	-
Metals, Cyanide, and Phenolics							
Beryllium	3M	-	-	-	-	-	.01
Chromium	5M	-	.02	.02	-	.02	.05
Copper	6M	.02	.15	.08	.06	.12	.21
Nickel	9M	.02	.06	.04	.02	.04	.09
Zinc	13M	.03	.13	.20	.04	.08	.24
Cyanide, total	14M	-	-	-	-	-	.04
Phenolics, total	15M	-	-	-	1.4	3.2	-
Conventional Analysis Data							
Barium		.17	.60	.26	.14	.32	.73
Iron		5.2	25.	27.	9.7	17.	39.
pH (s. u.)		7.7	8.4	8.1	7.8	8.6	8.6
Oil and Grease		4	4	5	3	-	2
Total Organic Carbon (TOC)		47.	1.7	5.5	4.1	2.5	7.7
Total Dissolved Solids (TDS)		310	250	410	530	460	292
Specific Conductance (umhos/cm)		408	365	329	287	342	271

Note: Samples analyzed for priority pollutants and conventional parameters. A compound is reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00036

TABLE 6.19

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - DOWNGRADIENT WELLS
MARCH 14, 1984
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells M-2	O-2	M-3	M-4	M-5	O-3
Volatile Compounds							
Ethylbenzene	19V	.02	-	-	-	-	-
Methylene chloride	22V	-	-	.02	.02	.02	-
Conventional Analysis Data							
Oil and Grease		-	-	-	-	-	-
Total Organic Carbon (TOC)		26.5	<1	23	20	8.6	12

Note: Samples analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon. A compound is reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00037

TABLE 6.20

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - DOWNGRADIENT WELLS
AUGUST 23, 1984
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells M-2	O-2	M-3	M-4	M-5	O-3
Volatile Compounds							
Trichloroethene	29V	-	-	-	-	-	.02
Conventional Analysis Data							
Oil and Grease		2	9	22	2	-	11
Total Organic Carbon (TOC)		1.5	4.0	2.2	3.8	4.8	3.5
Total Phenolics		.05	.05	-	-	-	-

Note: Samples analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon. A compound is reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00037

TABLE 6.21

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - DOWNGRADIENT WELLS
DECEMBER 20, 1984
(ALL RESULTS IN MG/L)

Compound/Parameter	NPDES Number	Observation/Monitoring Wells M-2	O-2	M-3	M-4	M-5	O-3
Volatile Compounds							
Methylene chloride	22V	.03	.02	.01	-	-	.01
Conventional Analysis Data							
Oil and Grease		-	-	3	1	-	-
Total Organic Carbon (TOC)		2.7	13.	2.5	3.2	3.7	6.5
Total Phenolics		-	-	-	.65	.16	-

Note: Samples analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon. A compound is reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00037

TABLE 6.22

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - DOWNGRADIENT WELLS
NOVEMBER 18, 1985
(ALL RESULTS IN MG/L)

Parameter	Observation/Monitoring Wells					
Parameter	M-2	O-2	M-3	M-4	M-5	0-3
ES Sample Number	(5332)	(5334)	(5329)	(5325)	(5324)	(5321)
Volatile Compounds						
Acetone	-	.04	-	.12	5.0	-
Trichloroethene	-	-	-	-	-	<.01
Conventional Parameters						
Oil and Grease	-	-	1.	-	-	-
Total Organic Carbon (TOC)	.50	1.0	1.2	1.1	1.1	1.7
Total Phenolics	.10	.08	.05	-	.11	.05

Note: Samples analyzed for priority pollutant volatile compounds, PCBs, oil and grease, total phenolic compounds, and total organic carbon. A compound is reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00039

TABLE 6.23

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - DOWNGRADIENT WELLS
JUNE 23, 1986
(ALL RESULTS IN MG/L)

	Observation/Monitoring Well					
Parameter	M-2	O-2	M-3	M-4	M-5	O-3
ES Sample Number	(5364)	(5365)	(5366)	(5369)	(5370)	(5359)
Volatile Compounds						
Trichloroethene	-	-	-	-	.004	.003
Base/Neutral Compounds						
Di-n-butyl phthalate	-	.001	-	-	-	-
Bis (2-ethylhexyl) phthalate	.015	-	-	-	-	-
Metals, Cyanide, and Phenolics						
Arsenic	.002	-	.009	.005	.006	.006
Beryllium	-	-	.003	-	-	-
Total Chromium	-	-	-	-	.003	-
Copper	.009	-	-	.008	.004	.005
Lead	.006	-	-	-	-	-
Mercury	-	-	.0003	-	-	-
Zinc	.01	-	-	.02	.02	.16

Note: Samples analyzed for priority pollutant volatiles, base/neutrals, and metals. A compound is reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00038

TABLE 6.24

SUMMARY OF WATER QUALITY ANALYSIS DATA
DEEP ZONE - DOWNGRADIENT WELLS
SEPTEMBER 8, 1986
(ALL RESULTS IN MG/L)

	Observation/Monitoring Well					
Parameter	M-2	O-2	M-3	M-4	M-5	O-3
ES Sample Number	(5379)	(5380)	(5381)	(5382)	(5383)	(5373)
Metals, Cyanide, and Phenolics						
Cadmium	-	-	-	.0005	-	-
Copper	.008	.009	.006	.005	.006	-
Lead	.003	.003	.002	.002	.002	.001
Nickel	.004	.009	.001	.001	.001	.005
Silver	.0004	-	-	-	-	-
Zinc	.020	.028	.006	.014	.014	.005

Note: Samples analyzed for priority pollutant volatiles, base/neutrals, and metals. A compound is reported here only if it was above analytical detection limits in one or more samples.

MAC/SY027/00038

APPENDIX H

WATER QUALITY ANALYSIS RESULTS

Summaries of the analytical results for both groundwater surveys are included herein. Also included are the summarized results of all test boring analyses, sediment analyses, and test pit analyses. The individual sample analyses and quality assurance/quality control results are included under separate cover. They consist of the complete data reports from the Environmental Testing and Certification, Inc. (ETC) laboratory.

DM-1C
Summary of results for only those parameters found at or above method detection limits, by facility and sample point.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

February 21, 1984
Page 1

Chain of Custody Data Required for ETC Data Management Summary Report

ETC Sample No.	Company	Facility	Sample Point	Date
See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	

Parameters	Units	W 01-D 831115 D5371	W 01-S 831115 D5370	W 02-D 831116 D5373	W 02-S 831116 D5372	W 03-D 831115 D5375	W 03-S 831115 D5374	W 04-D 831115 D5769	W 04-D-BLAN 831116 D5379
PP Volatile Compounds									
Benzene	ug/l	ND	ND	ND	637	ND	ND	ND	ND
Chlorobenzene	ug/l	ND	ND	BMDL	2830	ND	ND	ND	BMDL
Chloroform	ug/l	ND	ND	ND	BMDL	ND	ND	ND	BMDL
1,2-Dichloroethane	ug/l	ND	ND	ND	BMDL	ND	ND	BMDL	ND
Ethylbenzene	ug/l	ND	ND	ND	21600	ND	ND	ND	ND
Methyl chloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ug/l	BMDL	BMDL	BMDL	109	BMDL	BMDL	11	70
Tetrachloroethylene	ug/l	115	ND	ND	BMDL	ND	ND	ND	ND
Toluene	ug/l	ND	ND	BMDL	3110	ND	ND	ND	BMDL
1,2-Trans-dichloroethylene	ug/l	59	ND	ND	316	ND	ND	BMDL	ND
Trichloroethylene	ug/l	59	BMDL	ND	BMDL	ND	ND	182	ND
PP Acid Compounds									
4-Nitrophenol	ug/l	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	ug/l	ND	ND	BMDL	BMDL	BMDL	BMDL	ND	ND
PP Base/Neutral Compounds									
bis(2-Ethylhexyl)phthalate	ug/l	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,2-Dichlorobenzene	ug/l	ND	ND	ND	393	ND	ND	ND	ND
1,3-Dichlorobenzene	ug/l	ND	ND	ND	BMDL	ND	ND	ND	ND
1,4-Dichlorobenzene	ug/l	ND	ND	ND	60	ND	ND	ND	ND
Di-n-butyl phthalate	ug/l	ND	BMDL	BMDL	BMDL	BMDL	BMDL	ND	32
Naphthalene	ug/l	ND	ND	ND	75	ND	ND	ND	ND
PP Metals									
Arsenic	ug/l	ND	BMDL	BMDL	10	BMDL	ND	ND	ND
Beryllium	ug/l	BMDL	ND	BMDL	BMDL	6	BMDL	BMDL	ND
Cadmium	ug/l	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	ug/l	58	BMDL	23	36	45	25	23	ND
Copper	ug/l	300	21	150	110	210	70	120	ND
Lead	ug/l	90	ND	BMDL	BMDL	BMDL	BMDL	ND	ND
Mercury	ug/l	0.4	0.6	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

February 21, 1984
Page 2

Chain of Custody Data Required for ETC Data Management Summary Report

ETC Sample No.	Company	Facility	Sample Point	Date
See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	

Parameters	Units	W 01-D 831115 D5371	W 01-S 831115 D5370	W 02-D 831116 D5373	W 02-S 831116 D5372	W 03-D 831115 D5375	W 03-S 831115 D5374	W 04-D 831115 D5769	W 04-D-BLANK 831116 D5379
Nickel	ug/l	110	BMDL	58	40	93	51	56	ND
Selenium	ug/l	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	ug/l	600	51	130	240	240	120	170	ND
Cyanide, Total	ug/l	-	<25	<25	<25	36000	<25	<25	<25
Phenolics, Total	ug/l	-	<50	<50	110	<50	<50	<50	750
GW Conventionals									
Phenolics, Total	mg/l	-	<0.05	<0.05	0.11	<0.05	<0.05	<0.05	0.75
Total Organic Carbon	mg/l	8.9	40	<1	181	7.7	29	5.9	<1
Total Organic Carbon	mg/l	8.7	40	1.7	181	8.2	28	5.8	<1
Specific Conductance	um/cm	445	2450	365	1720	271	962	451	4
pH	std	7.6	7	8.4	6.6	8.6	7.8	7.2	6.7
Miscellaneous Parameters									
Barium	ug/l	1100	1300	600	560	730	350	540	ND
Iron	ug/l	44000	9300	25000	25000	39000	29000	19000	ND
Oil and Grease	mg/l	<1	<1	4	8	1.5	6	<1	<1
Total Dissolved Solids (TDS)	mg/l	512	1850	250	1520	292	1710	364	<10

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

February 21, 1984
Page 3

Chain of Custody Data Required for ETC Data Management Summary Report				
See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	
ETC Sample No.	Company	Facility	Sample Point	Date

Parameters	Units	W 04-S 831115 D5770	R 2 830929 D2644	S CSLNT01 831024 D3919	S CSLST01 831024 D3887	X ESPOOL 831207 D7036	W MI-D 831115 D5383	W MI-S 831115 D5382	W M2-D 831115 D5385
PP Volatile Compounds									
Benzene	ug/l	ND	ND	ND	BMDL	ND	ND	ND	ND
Chlorobenzene	ug/l	ND	BMDL	950	5290	ND	ND	ND	ND
Chloroform	ug/l	ND	ND	ND	ND	BMDL	BMDL	ND	BMDL
1,2-Dichloroethane	ug/l	20	ND	ND	BMDL	ND	ND	ND	ND
Ethylbenzene	ug/l	ND	ND	510	2840	256	ND	ND	ND
Methyl chloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ug/l	12	13	720	640	BMDL	BMDL	14	BMDL
Tetrachloroethylene	ug/l	ND	ND	ND	ND	BMDL	BMDL	357	ND
Toluene	ug/l	ND	ND	ND	1100	BMDL	ND	ND	ND
1,2-Trans-dichloroethylene	ug/l	ND	ND	ND	ND	ND	BMDL	ND	ND
Trichloroethylene	ug/l	BMDL	ND	ND	ND	ND	BMDL	BMDL	ND
PP Acid Compounds									
4-Nitrophenol	ug/l	ND	ND	ND	2890	-	ND	ND	ND
Phenol	ug/l	ND	ND	BMDL	BMDL	-	ND	ND	ND
PP Base/Neutral Compounds									
bis(2-Ethylhexyl)phthalate	ug/l	BMDL	ND	ND	ND	-	BMDL	BMDL	18
1,2-Dichlorobenzene	ug/l	ND	ND	52	553	-	ND	ND	ND
1,3-Dichlorobenzene	ug/l	ND	ND	ND	ND	-	ND	ND	ND
1,4-Dichlorobenzene	ug/l	ND	ND	BMDL	BMDL	-	ND	ND	ND
Di-n-butyl phthalate	ug/l	ND	ND	ND	ND	-	ND	BMDL	BMDL
Naphthalene	ug/l	ND	ND	ND	BMDL	-	ND	ND	ND
PP Metals									
Arsenic	ug/l	BMDL	ND	BMDL	6	-	13	BMDL	BMDL
Beryllium	ug/l	ND	ND	ND	ND	-	BMDL	ND	ND
Cadmium	ug/l	ND	ND	BMDL	ND	-	ND	ND	ND
Chromium	ug/l	15	ND	20	10	-	54	BMDL	BMDL
Copper	ug/l	20	20	36	27	-	210	12	21
Lead	ug/l	BMDL	ND	BMDL	BMDL	-	60	ND	ND
Mercury	ug/l	BMDL	ND	0.4	BMDL	-	BMDL	BMDL	BMDL

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

Chain of Custody Data Required for ETC Data Management Summary Report

See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	
ETC Sample No.	Company	Facility	Sample Point	Date

Parameters	Units	W 04-S 831115 D5770	R 2 830929 D2644	S CSLNT01 831024 D3919	S CSLST01 831024 D3887	X ESPOOL 831207 D7036	W M1-D 831115 D5383	W M1-S 831115 D5382	W M2-D 831115 D5385
Nickel	ug/l	19	100	BMDL	10	-	84	12	18
Selenium	ug/l	ND	ND	ND	ND	-	9	ND	BMDL
Zinc	ug/l	29	100	22	18	-	560	30	32
Cyanide, Total	ug/l	<25	<125	<50	<50	-	29	32	<25
Phenolics, Total	ug/l	<50	350	1400	3000	-	<50	<50	<50
GW Conventionals									
Phenolics, Total	mg/l	<0.05	0.35	1.4	3	-	<0.05	<0.05	<0.05
Total Organic Carbon	mg/l	7.1	-	-	-	-	19	5.5	47
Total Organic Carbon	mg/l	6.8	-	-	-	-	18	5.7	46
Specific Conductance	um/cm	948	-	-	-	-	531	563	408
pH	std	7.4	-	-	-	-	7.8	7	7.7
Miscellaneous Parameters									
Barium	ug/l	160	-	-	-	-	950	72	170
Iron	ug/l	10000	-	-	-	-	62000	6000	5200
Oil and Grease	mg/l	<1	-	-	-	-	<1	<1	4.1
Total Dissolved Solids (TDS)	mg/l	846	-	-	-	-	472	480	310

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

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Chain of Custody Data Required for ETC Data Management Summary Report

See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	
ETC Sample No.	Company	Facility	Sample Point	Date

Parameters	Units	W M2-S 831115 D5384	W M3-D 831116 D5369	W M3-S 831116 D5368	W M4-D 831116 D5381	W M4-S 831116 D5380	W M5-D 831116 D5377	W M5-S 831116 D5376	S NORTHPIT2 831024 D3885
PP Volatile Compounds									
Benzene	ug/l	ND	ND	ND	ND	720	ND	241	BMDL
Chlorobenzene	ug/l	ND	ND	ND	ND	ND	72	1460	4270
Chloroform	ug/l	BMDL	BMDL	BMDL	BMDL	ND	ND	127	BMDL
1,2-Dichloroethane	ug/l	ND	ND	ND	ND	ND	ND	78	ND
Ethylbenzene	ug/l	ND	ND	ND	ND	6420	345	ND	152000
Methyl chloride	ug/l	ND	ND	37	ND	ND	ND	ND	ND
Methylene chloride	ug/l	BMDL	BMDL	BMDL	BMDL	ND	BMDL	317	510
Tetrachloroethylene	ug/l	ND	ND	BMDL	ND	ND	ND	ND	ND
Toluene	ug/l	ND	ND	ND	BMDL	940	121	1850	710
1,2-Trans-dichloroethylene	ug/l	ND	ND	ND	ND	ND	ND	BMDL	ND
Trichloroethylene	ug/l	ND	BMDL	BMDL	BMDL	ND	ND	BMDL	ND
PP Acid Compounds									
4-Nitrophenol	ug/l	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	ug/l	ND	ND	ND	ND	ND	BMDL	ND	BMDL
PP Base/Neutral Compounds									
bis(2-Ethylhexyl)phthalate	ug/l	BMDL	17	BMDL	BMDL	ND	BMDL	BMDL	ND
1,2-Dichlorobenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	12
1,3-Dichlorobenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	14
1,4-Dichlorobenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	133
Di-n-butyl phthalate	ug/l	ND	BMDL	ND	BMDL	19	BMDL	ND	ND
Naphthalene	ug/l	ND	ND	ND	ND	13	ND	ND	BMDL
PP Metals									
Arsenic	ug/l	BMDL	ND	BMDL	BMDL	6	ND	BMDL	13
Beryllium	ug/l	ND	BMDL	ND	ND	ND	BMDL	BMDL	ND
Cadmium	ug/l	ND	ND	ND	ND	ND	ND	ND	BMDL
Chromium	ug/l	BMDL	23	21	BMDL	BMDL	18	39	BMDL
Copper	ug/l	26	81	38	56	34	120	250	45
Lead	ug/l	ND	BMDL	ND	ND	ND	ND	BMDL	60
Mercury	ug/l	BMDL	BMDL	ND	BMDL	0.5	BMDL	BMDL	BMDL

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

Chain of Custody Data Required for ETC Data Management Summary Report

See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	
ETC Sample No.	Company	Facility	Sample Point	Date

Parameters	Units	W M2-S 831115 D5384	W M3-D 831116 D5369	W M3-S 831116 D5368	W M4-D 831116 D5381	W M4-S 831116 D5380	W M5-D 831116 D5377	W M5-S 831116 D5376	S NORTHPIT2 831024 D3885
Nickel	ug/l	BMDL	35	25	16	19	35	35	BMDL
Selenium	ug/l	BMDL	ND	ND	BMDL	BMDL	ND	ND	ND
Zinc	ug/l	12	200	120	43	32	75	90	65
Cyanide, Total	ug/l	28	<25	<25	<25	31	<25	26	<50
Phenolics, Total	ug/l	<50	<50	<50	1400	9000	3200	36000	200
GW Conventionals									
Phenolics, Total	mg/l	<0.05	<0.05	<0.05	1.4	9	3.2	36	0.2
Total Organic Carbon	mg/l	28	5.5	33	4.1	310	2.5	2410	-
Total Organic Carbon	mg/l	28	5.5	33	3.9	320	2.8	2200	-
Specific Conductance	um/cm	917	329	1750	287	2480	342	3550	-
pH	std	7.6	8.1	6.6	7.8	7.6	8.6	7	-
Miscellaneous Parameters									
Barium	ug/l	87	260	360	140	200	320	940	-
Iron	ug/l	3600	27000	39000	9700	6600	17000	25000	-
Oil and Grease	mg/l	3.6	5	10	3	32	<1	120	-
Total Dissolved Solids (TDS)	mg/l	618	410	1820	530	1980	460	5240	-

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

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Chain of Custody Data Required for ETC Data Management Summary Report

ETC Sample No.	Company	Facility	Sample Point	Date
See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	

Parameters	Units	S 1 830929 D2648	S 2 830929 D2647	X CSLD015 831021 D3953	S CSLT01S 831021 D3951	S CSLT02N 831021 D3952	S CSLTB2 831114 D5387	S CSLTB3 831114 D5388	S CSLTB4 831115 D5389
		Sample Points, Sampling Dates, and ETC Sample No.'s							
PP Volatile Compounds									
Benzene	ug/kg	ND	ND	BMDL	ND	ND	506	BMDL	-
Chlorobenzene	ug/kg	73600	ND	BMDL	BMDL	8250	237	96	BMDL
Chlorodibromomethane	ug/kg	ND	ND	ND	ND	ND	ND	ND	-
Chloroform	ug/kg	ND	ND	ND	ND	ND	ND	ND	-
1,2-Dichloroethane	ug/kg	ND	ND	BMDL	ND	ND	980	BMDL	-
Ethylbenzene	ug/kg	>156000	ND	8340	64200	15700	7160	821	13800
Methylene chloride	ug/kg	ND	BMDL	3520	BMDL	3260	BMDL	BMDL	-
Tetrachloroethylene	ug/kg	6870	ND	ND	ND	ND	BMDL	ND	-
Toluene	ug/kg	2580	BMDL	3020	BMDL	ND	3780	163	-
PP Acid Compounds									
Phenol	ug/kg	ND	BMDL	66800	BMDL	BMDL	-	-	-
PP Base/Neutral Compounds									
Benzo(a)anthracene	ug/kg	ND	ND	ND	BMDL	BMDL	ND	ND	-
Benzo(a)pyrene	ug/kg	ND	ND	ND	BMDL	BMDL	ND	ND	-
Benzo(b)fluoroanthene	ug/kg	ND	ND	ND	3800	707	ND	ND	-
Benzo(k)fluoranthene	ug/kg	ND	ND	ND	3800	707	ND	ND	-
bis(2-Ethylhexyl)phthalate	ug/kg	ND	ND	ND	ND	BMDL	ND	ND	-
Chrysene	ug/kg	ND	ND	ND	BMDL	557	ND	ND	-
1,2-Dichlorobenzene	ug/kg	-	ND	ND	4430	BMDL	ND	ND	-
Fluoranthene	ug/kg	-	ND	ND	BMDL	690	ND	ND	-
Phenanthrene	ug/kg	ND	ND	ND	BMDL	547	ND	ND	-
Pyrene	ug/kg	ND	ND	ND	3300	630	ND	ND	-
PP Pesticide Compounds									
PCB-1248	ug/kg	-	-	ND	ND	ND	ND	ND	ND
PCB-1248 (GC/MS)	ug/kg	-	-	-	-	-	-	-	-
PP Metals									

Footnotes: BMDL=Below Method Detection Limit   ND=Parameter not detected   '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

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Chain of Custody Data Required for ETC Data Management Summary Report

See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	
ETC Sample No.	Company	Facility	Sample Point	Date

Parameters	Units	S 1 830929 D2648	S 2 830929 D2647	X CSLD015 831021 D3953	S CSLT01S 831021 D3951	S CSLT02N 831021 D3952	S CSLTB2 831114 D5387	S CSLTB3 831114 D5388	S CSLTB4 831115 D5389
Chromium	ug/kg	-	-	66000	-	-	-	-	-
Copper	ug/kg	-	-	79000	-	-	-	-	-
Lead	ug/kg	-	-	11000	-	-	-	-	-
Nickel	ug/kg	-	-	25000	-	-	-	-	-
Zinc	ug/kg	-	-	170000	-	-	-	-	-
Phenolics, Total	ug/kg	-	-	104E+5	9000	7000	-	-	-
GW Conventionals									
Phenolics, Total	mg/kg	-	-	10400	9	7	-	-	-

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

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Chain of Custody Data Required for ETC Data Management Summary Report

ETC Sample No.	Company	Facility	Sample Point	Date
See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	

Parameters	Units	S CSLTB7 831117 D5392	B DS-BANK 831110 D5545	B DS-CENTER 831110 D5546	S DSATB1 831122 D5396	S DSATB10 831122 D5405	S DSATB2 831122 D5397	S DSATB3 831122 D5398	S DSATB4 831122 D5399
PP Volatile Compounds									
Benzene	ug/kg	2090	ND	ND	-	-	-	-	-
Chlorobenzene	ug/kg	ND	ND	ND	BMDL	ND	3190	BMDL	ND
Chlorodibromomethane	ug/kg	1420	ND	ND	-	-	-	-	-
Chloroform	ug/kg	476	ND	ND	-	-	-	-	-
1,2-Dichloroethane	ug/kg	2210	ND	ND	-	-	-	-	-
Ethylbenzene	ug/kg	26000	ND	ND	273	ND	9730	3340	ND
Methylene chloride	ug/kg	BMDL	63	BMDL	-	-	-	-	-
Tetrachloroethylene	ug/kg	BMDL	ND	ND	-	-	-	-	-
Toluene	ug/kg	11700	BMDL	BMDL	-	-	-	-	-
PP Acid Compounds									
Phenol	ug/kg	-	-	-	-	-	-	-	-
PP Base/Neutral Compounds									
Benzo(a)anthracene	ug/kg	ND	-	-	-	-	-	-	-
Benzo(a)pyrene	ug/kg	ND	-	-	-	-	-	-	-
Benzo(b)fluoroanthene	ug/kg	ND	-	-	-	-	-	-	-
Benzo(k)fluoranthene	ug/kg	ND	-	-	-	-	-	-	-
bis(2-Ethylhexyl)phthalate	ug/kg	ND	-	-	-	-	-	-	-
Chrysene	ug/kg	ND	-	-	-	-	-	-	-
1,2-Dichlorobenzene	ug/kg	ND	-	-	-	-	-	-	-
Fluoranthene	ug/kg	ND	-	-	-	-	-	-	-
Phenanthrene	ug/kg	ND	-	-	-	-	-	-	-
Pyrene	ug/kg	ND	-	-	-	-	-	-	-
PP Pesticide Compounds									
PCB-1248	ug/kg	ND	-	-	BMDL	BMDL	113000	ND	ND
PCB-1248 (GC/MS)	ug/kg	-	ND	ND	-	-	-	-	-
PP Metals									

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

February 21, 1984

Chain of Custody Data Required for ETC Data Management Summary Report

See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	
ETC Sample No.	Company	Facility	Sample Point	Date

		Sample Points, Sampling Dates, and ETC Sample No.'s							
Parameters	Units	S CSLTB7 831117 D5392	B DS-BANK 831110 D5545	B DS-CENTER 831110 D5546	S DSATB1 831122 D5396	S DSATB10 831122 D5405	S DSATB2 831122 D5397	S DSATB3 831122 D5398	S DSATB4 831122 D5399
Chromium	ug/kg	-	-	-	-	-	-	-	-
Copper	ug/kg	-	-	-	-	-	-	-	-
Lead	ug/kg	-	-	-	-	-	-	-	-
Nickel	ug/kg	-	-	-	-	-	-	-	-
Zinc	ug/kg	-	-	-	-	-	-	-	-
Phenolics, Total	ug/kg	-	-	-	-	-	-	-	-
GW Conventionals									
Phenolics, Total	ug/kg	-	-	-	-	-	-	-	-

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

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Chain of Custody Data Required for ETC Data Management Summary Report

ETC Sample No.	Company	Facility	Sample Point	Date
See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	

		Sample Points, Sampling Dates, and ETC Sample No.'s							
Parameters	Units	S DSATB5 831122 D5400	S DSATB6 831122 D5401	S DSATB7 831122 D5402	S DSATB8 831122 D5403	S DSATB9 831122 D5404	S ES178DUP 831028 D4162	S ES184DUP 831028 D4164	S ES185DUP 831028 D4163
PP Volatile Compounds									
Benzene	ug/kg	-	-	-	-	-	-	-	-
Chlorobenzene	ug/kg	BMDL	BMDL	BMDL	BMDL	ND	-	-	-
Chlorodibromomethane	ug/kg	-	-	-	-	-	-	-	-
Chloroform	ug/kg	-	-	-	-	-	-	-	-
1,2-Dichloroethane	ug/kg	-	-	-	-	-	-	-	-
Ethylbenzene	ug/kg	BMDL	ND	BMDL	ND	ND	-	-	-
Methylene chloride	ug/kg	-	-	-	-	-	-	-	-
Tetrachloroethylene	ug/kg	-	-	-	-	-	-	-	-
Toluene	ug/kg	-	-	-	-	-	-	-	-
PP Acid Compounds									
Phenol	ug/kg	-	-	-	-	-	-	-	-
PP Base/Neutral Compounds									
Benzo(a)anthracene	ug/kg	-	-	-	-	-	-	-	-
Benzo(a)pyrene	ug/kg	-	-	-	-	-	-	-	-
Benzo(b)fluoroanthene	ug/kg	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	ug/kg	-	-	-	-	-	-	-	-
bis(2-Ethylhexyl)phthalate	ug/kg	-	-	-	-	-	-	-	-
Chrysene	ug/kg	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	ug/kg	-	-	-	-	-	-	-	-
Fluoranthene	ug/kg	-	-	-	-	-	-	-	-
Phenanthrene	ug/kg	-	-	-	-	-	-	-	-
Pyrene	ug/kg	-	-	-	-	-	-	-	-
PP Pesticide Compounds									
PCB-1248	ug/kg	ND	ND	BMDL	448	BMDL	-	-	-
PCB-1248 (GC/MS)	ug/kg	-	-	-	-	-	ND	47000	25800
PP Metals									

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

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Chain of Custody Data Required for ETC Data Management Summary Report

See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	
ETC Sample No.	*Company*	*Facility*	*Sample Point*	*Date*

Sample Points, Sampling Dates, and ETC Sample No.'s

Parameters	*Units*	S DSATB5 831122 D5400	S DSATB6 831122 D5401	S DSATB7 831122 D5402	S DSATB8 831122 D5403	S DSATB9 831122 D5404	S ES178DUP 831028 D4162	S ES184DUP 831028 D4164	S ES185DUP 831028 D4163
Chromium	ug/kg	-	-	-	-	-	-	-	-
Copper	ug/kg	-	-	-	-	-	-	-	-
Lead	ug/kg	-	-	-	-	-	-	-	-
Nickel	ug/kg	-	-	-	-	-	-	-	-
Zinc	ug/kg	-	-	-	-	-	-	-	-
Phenolics, Total	ug/kg	-	-	-	-	-	-	-	-
GW Conventionals									
Phenolics, Total	ug/kg	-	-	-	-	-	-	-	-

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

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Chain of Custody Data Required for ETC Data Management Summary Report

ETC Sample No.	Company	Facility	Sample Point	Date
See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	

Parameters	Units	S NORTHPIT1 831025 D4050	S NORTHPIT2 831025 D4051	S NORTHPIT3 831025 D4052	B SEEP-BANK 831110 D5549	B SEEP-CENT 831110 D5550	B US-BANK 831110 D5547	B US-CENTER 831110 D5548
PP Volatile Compounds								
Benzene	ug/kg	BMDL	BMDL	2360	BMDL	BMDL	ND	ND
Chlorobenzene	ug/kg	BMDL	2590	1640	ND	ND	ND	ND
Chlorodibromomethane	ug/kg	ND	ND	ND	ND	ND	ND	ND
Chloroform	ug/kg	ND	ND	BMDL	ND	ND	ND	ND
1,2-Dichloroethane	ug/kg	ND	ND	1250	ND	ND	ND	ND
Ethylbenzene	ug/kg	1240	6210	47500	ND	ND	ND	ND
Methylene chloride	ug/kg	547	BMDL	744	406	279	BMDL	75
Tetrachloroethylene	ug/kg	ND	BMDL	ND	ND	ND	ND	ND
Toluene	ug/kg	202	467	34100	ND	ND	BMDL	BMDL
PP Acid Compounds								
Phenol	ug/kg	BMDL	BMDL	BMDL	-	-	-	-
PP Base/Neutral Compounds								
Benzo(a)anthracene	ug/kg	BMDL	4900	ND	-	-	-	-
Benzo(a)pyrene	ug/kg	BMDL	4470	ND	-	-	-	-
Benzo(b)fluoroanthene	ug/kg	710	11800	ND	-	-	-	-
Benzo(k)fluoranthene	ug/kg	710	11800	ND	-	-	-	-
bis(2-Ethylhexyl)phthalate	ug/kg	377	51700	ND	-	-	-	-
Chrysene	ug/kg	530	8800	ND	-	-	-	-
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	-	-	-	-
Fluoranthene	ug/kg	620	10300	ND	-	-	-	-
Phenanthrene	ug/kg	567	10400	ND	-	-	-	-
Pyrene	ug/kg	693	11900	ND	-	-	-	-
PP Pesticide Compounds								
PCB-1248	ug/kg	ND	ND	ND	-	ND	-	-
PCB-1248 (GC/MS)	ug/kg	-	-	-	ND	-	ND	ND
PP Metals								

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

Chain of Custody Data Required for ETC Data Management Summary Report

See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	
ETC Sample No.	Company	Facility	Sample Point	Date

Parameters	Units	S NORTHPIT1 831025 D4050	S NORTHPIT2 831025 D4051	S NORTHPIT3 831025 D4052	B SEEP-BANK 831110 D5549	B SEEP-CENT 831110 D5550	B US-BANK 831110 D5547	B US-CENTER 831110 D5548
Chromium	ug/kg	-	-	-	-	-	-	-
Copper	ug/kg	-	-	-	-	-	-	-
Lead	ug/kg	-	-	-	-	-	-	-
Nickel	ug/kg	-	-	-	-	-	-	-
Zinc	ug/kg	-	-	-	-	-	-	-
Phenolics, Total	ug/kg	100	700	1700	-	-	-	-
GW Conventionals								
Phenolics, Total	mg/kg	0.1	0.7	1.7	-	-	-	-

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

February 21, 1984
Page 7

Chain of Custody Data Required for ETC Data Management Summary Report

ETC Sample No.	Company	Facility	Sample Point	Date
See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	

Parameters	Units	S NORTHPIT3 831024 D3886	R RI 830929 D2645						
PP Volatile Compounds									
Benzene	ug/l	BMDL	ND						
Chlorobenzene	ug/l	2460	BMDL						
Chloroform	ug/l	1080	ND						
1,2-Dichloroethane	ug/l	ND	ND						
Ethylbenzene	ug/l	30900	BMDL						
Methyl chloride	ug/l	ND	ND						
Methylene chloride	ug/l	BMDL	17						
Tetrachloroethylene	ug/l	ND	ND						
Toluene	ug/l	4360	ND						
1,2-Trans-dichloroethylene	ug/l	ND	BMDL						
Trichloroethylene	ug/l	ND	ND						
PP Acid Compounds									
4-Nitrophenol	ug/l	ND	ND						
Phenol	ug/l	246	BMDL						
PP Base/Neutral Compounds									
bis(2-Ethylhexyl)phthalate	ug/l	ND	ND						
1,2-Dichlorobenzene	ug/l	890	BMDL						
1,3-Dichlorobenzene	ug/l	ND	ND						
1,4-Dichlorobenzene	ug/l	BMDL	ND						
Di-n-butyl phthalate	ug/l	ND	ND						
Naphthalene	ug/l	BMDL	ND						
PP Metals									
Arsenic	ug/l	10	-						
Beryllium	ug/l	ND	-						
Cadmium	ug/l	9	-						
Chromium	ug/l	120	-						
Copper	ug/l	140	-						
Lead	ug/l	100	-						
Mercury	ug/l	0.3	-						

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1C) - All Parameters Present, Selected Samples

February 21, 1984
Page 8

Chain of Custody Data Required for ETC Data Management Summary Report

ETC Sample No.	Company	Facility	Sample Point	Date
See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	

Parameters	Units	S NORTHPIT3 831024 D3886	R RI 830929 D2645						
Nickel	ug/l	20	-						
Selenium	ug/l	ND	-						
Zinc	ug/l	200	-						
Cyanide, Total	ug/l	<50	-						
Phenolics, Total	ug/l	1500	-						
GW Conventionals									
Phenolics, Total	mg/l	1.5	-						
Total Organic Carbon	mg/l	-	-						
Total Organic Carbon	mg/l	-	-						
Specific Conductance	um/cm	-	-						
pH	std	-	-						
Miscellaneous Parameters									
Barium		-	-						
Iron		-	-						
Oil and Grease		-	-						
Total Dissolved Solids (TDS)		-	-						

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1L) – All Parameters Present, Samples Linked by Order

April 10, 1984
Page 1

Chain of Custody Data Required for ETC Data Management Summary Report

See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	
ETC Sample No.	*Company*	*Facility*	*Sample Point*	*Date*

		Sample Points, Sampling Dates, and ETC Sample No.'s							
Parameters	*Units*	W 01-D 840314 E1706	W 01-S 840314 E1702	W 02-D 840314 E1699	W 02-S 840314 E1701	W 03-D 840314 E1704	W 03-S 840314 E1698	W 04-D 840314 E1706	W 04-S 840314 E1696
PP Volatile Compounds									
Benzene	ug/l	ND	ND	ND	712	ND	ND	ND	ND
Chlorobenzene	ug/l	ND	BMDL	ND	2340	ND	ND	BMDL	ND
Chloroform	ug/l	ND	ND	ND	36	ND	BMDL	ND	ND
1,2-Dichloroethane	ug/l	ND	BMDL	ND	148	ND	BMDL	ND	50
Ethylbenzene	ug/l	ND	23	ND	15400	ND	ND	BMDL	BMDL
Methylene chloride	ug/l	ND	BMDL	BMDL	95	BMDL	BMDL	BMDL	BMDL
1,1,2,2-Tetrachloroethane	ug/l	ND	14	ND	472	ND	ND	ND	ND
Tetrachloroethylene	ug/l	42	ND	ND	ND	BMDL	BMDL	ND	ND
Toluene	ug/l	ND	ND	ND	4180	ND	ND	BMDL	ND
1,2-Trans-dichloroethylene	ug/l	BMDL	BMDL	ND	459	ND	ND	ND	ND
Trichloroethylene	ug/l	23	BMDL	ND	195	BMDL	ND	23	ND
Vinyl chloride	ug/l	ND	ND	ND	19	ND	ND	ND	ND
PP Pesticide Compounds									
PCB-1248	ug/l	ND	15	ND	ND	ND	ND	ND	ND
PP Metals									
Phenolics, Total	ug/l	<50	<50	<50	210	<50	<50	<50	<50
GW Conventionals									
Phenolics, Total	mg/l	<0.05	<0.05	<0.05	0.21	<0.05	<0.05	<0.05	<0.05
Total Organic Carbon	mg/l	4.1	21	<1	192	12	8	23	17
Total Organic Carbon	mg/l	3.9	21	<1	190	12	8.3	23	17
Miscellaneous Parameters									
Oil and Grease	mg/l	<1	<1	<1	<1	<1	<1	<1	<1

Footnotes: BMDL=Below Method Detection Limit   ND=Parameter not detected   '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1L) - All Parameters Present, Samples Linked by Order

Chain of Custody Data Required for ETC Data Management Summary Report

See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	
ETC Sample No.	Company	Facility	Sample Point	Date

Parameters	Units	W M1-D 840314 E1693	W M1-S 840314 E1697	W M2-D 840314 E1703	W M2-S 840314 E1694	W M3-D 840314 E1700	W M3-S 840314 E1708	W M4-D 840314 E1691	W M5-D 840314 E1692
PP Volatile Compounds									
Benzene	ug/l	ND	ND	ND	BMDL	ND	ND	BMDL	ND
Chlorobenzene	ug/l	ND	ND	ND	BMDL	ND	ND	ND	ND
Chloroform	ug/l	ND	ND	BMDL	ND	ND	ND	ND	ND
1,2-Dichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ug/l	ND	ND	21	ND	BMDL	ND	ND	ND
Methylene chloride	ug/l	13	BMDL	BMDL	10	15	ND	15	20
1,1,2,2-Tetrachloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	ug/l	BMDL	468	BMDL	ND	ND	ND	BMDL	BMDL
Toluene	ug/l	ND	ND	ND	BMDL	ND	ND	ND	BMDL
1,2-Trans-dichloroethylene	ug/l	BMDL	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	ug/l	BMDL	10	ND	BMDL	ND	11	BMDL	BMDL
Vinyl chloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND
PP Pesticide Compounds									
PCB-1248	ug/l	ND	ND	ND	ND	ND	ND	ND	ND
PP Metals									
Phenolics, Total	ug/l	<50	<50	<50	<50	<50	150	<50	<50
GW Conventionals									
Phenolics, Total	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	0.15	<0.05	<0.05
Total Organic Carbon	mg/l	7.1	1.3	27	43	23	49	21	8.7
Total Organic Carbon	mg/l	7	1.4	26	40	23	51	19	8.4
Miscellaneous Parameters									
Oil and Grease	mg/l	<1	<1	<1	<1	<1	<1	<1	<1

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1L) - All Parameters Present, Samples Linked by Order

April 10, 1984
Page 3

Chain of Custody Data Required for ETC Data Management Summary Report

See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	
ETC Sample No.	Company	Facility	Sample Point	Date

Parameters	Units	W M5-S 840314 E1695							
		Sample Points, Sampling Dates, and ETC Sample No.'s							
PP Volatile Compounds									
Benzene	ug/l	ND							
Chlorobenzene	ug/l	1600							
Chloroform	ug/l	346							
1,2-Dichloroethane	ug/l	150							
Ethylbenzene	ug/l	3190							
Methylene chloride	ug/l	345							
1,1,2,2-Tetrachloroethane	ug/l	ND							
Tetrachloroethylene	ug/l	BMDL							
Toluene	ug/l	2560							
1,2-Trans-dichloroethylene	ug/l	ND							
Trichloroethylene	ug/l	10							
Vinyl chloride	ug/l	BMDL							
PP Pesticide Compounds									
PCB-1248	ug/l	ND							
PP Metals									
Phenolics, Total	ug/l	54000							
GW Conventionals									
Phenolics, Total	mg/l	54							
Total Organic Carbon	mg/l	2300							
Total Organic Carbon	mg/l	2300							
Miscellaneous Parameters									
Oil and Grease	mg/l	25							

Footnotes: BMDL=Below Method Detection Limit   ND=Parameter not detected   '-'=Parameter not tested

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT
(DM-1L) - All Parameters Present, Samples Linked by Order

April 10, 1984
Page 1

Chain of Custody Data Required for ETC Data Management Summary Report

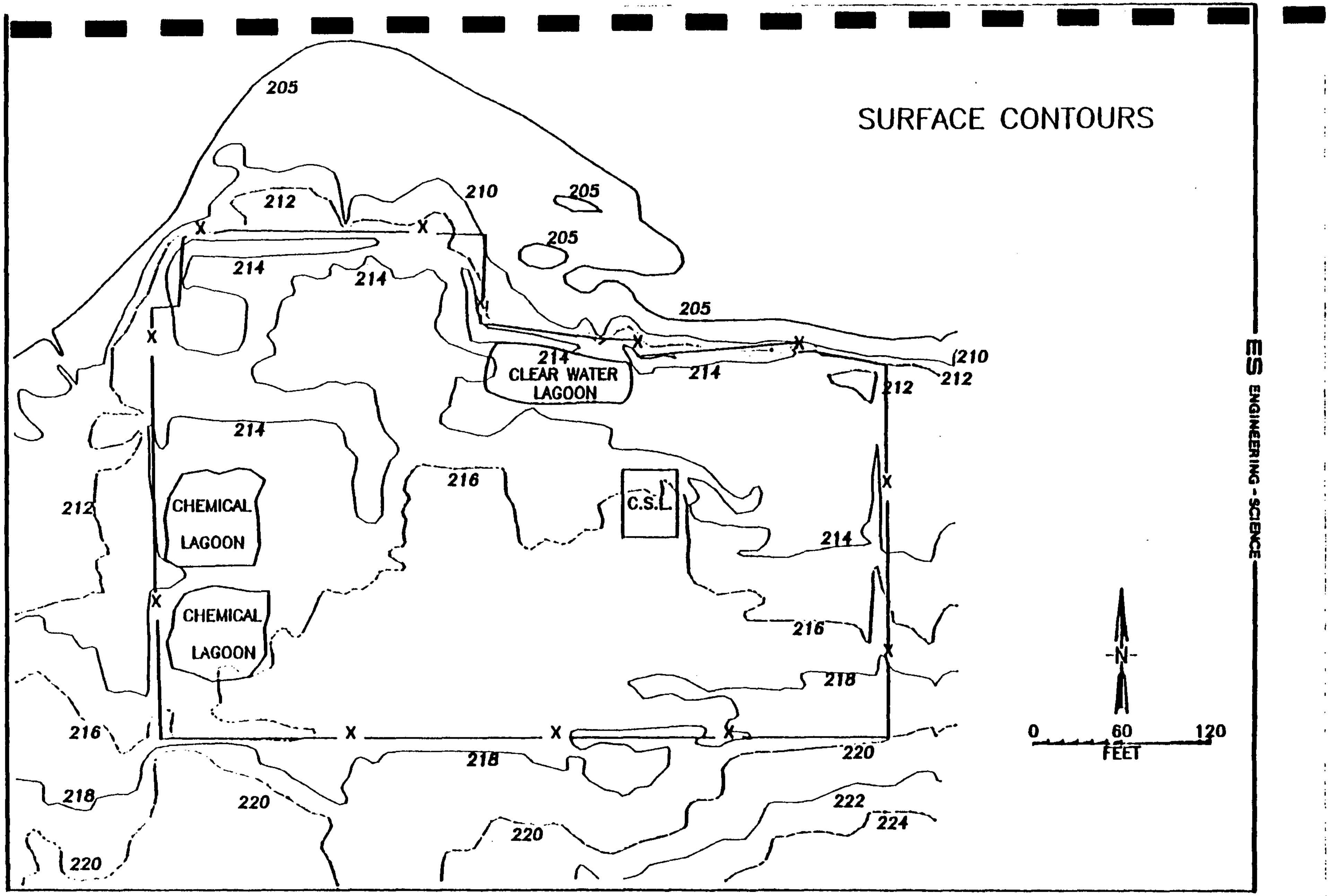
See Below	GULF OIL CORPORATION	BERKLEYHTS	See Below	
ETC Sample No.	Company	Facility	Sample Point	Date

Parameters	Units	W M4-S 840314 E1707							
PP Volatile Compounds									
Chlorobenzene	ug/kg	342000							
Ethylbenzene	ug/kg	223E+4							
Methylene chloride	ug/kg	320000							
Toluene	ug/kg	766000							
Trichloroethylene	ug/kg	600000							
PP Metals									
Phenolics, Total	mg/l	11							
GW Conventionals									
Phenolics, Total	mg/l	11							
Total Organic Carbon	mg/l	420							
Total Organic Carbon	mg/l	440							
Miscellaneous Parameters									
Oil and Grease	mg/l	50							

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested

APPENDIX L

SITE SURFACE TOPOGRAPHY



SURFACE CONTOURS
205
210
212
214
216
218
220
222
224
CLEAR WATER LAGOON
CHEMICAL LAGOON
CHEMICAL LAGOON
C.S.L.
N
0
60
120
FEET
ES ENGINEERING - SCIENCE

REFERENCE NO. 10

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

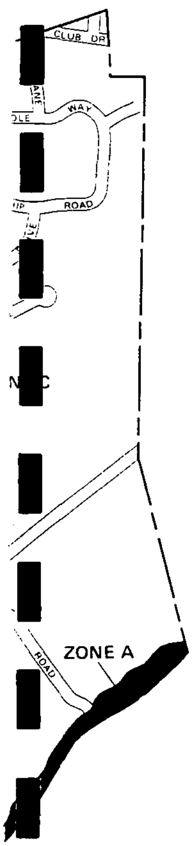
TOWNSHIP OF
BERKELEY HEIGHTS
NEW JERSEY
UNION COUNTY

COMMUNITY-PANEL NUMBER
340459 0001 B

PAGE 1 OF 1

EFFECTIVE
MARCH 1, 1978

U.S. DEPARTMENT OF HOUSING
AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION



KEY TO MAP

500-Year Flood Boundary

100-Year Flood Boundary

Zone Designations* With Date of Identification e.g., 12/2/74

100-Year Flood Boundary

500-Year Flood Boundary

Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
River Mile	• M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding with depth from 1 to 3 feet; product of flood depth (feet) and velocity (feet per second) less than 15.
A1 - A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by a flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of 100-year flood and 500-year flood; or areas of 100-year shallow flooding with depth less than 1 foot. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V0	Areas of 100-year shallow flooding with velocity; depth from 1 to 3 feet; product of depth (feet) and velocity (feet per second) more than 15.
V1 - V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

INITIAL IDENTIFICATION
MAY 24, 1974

CONVERSION TO REGULAR PROGRAM
MARCH 1, 1978

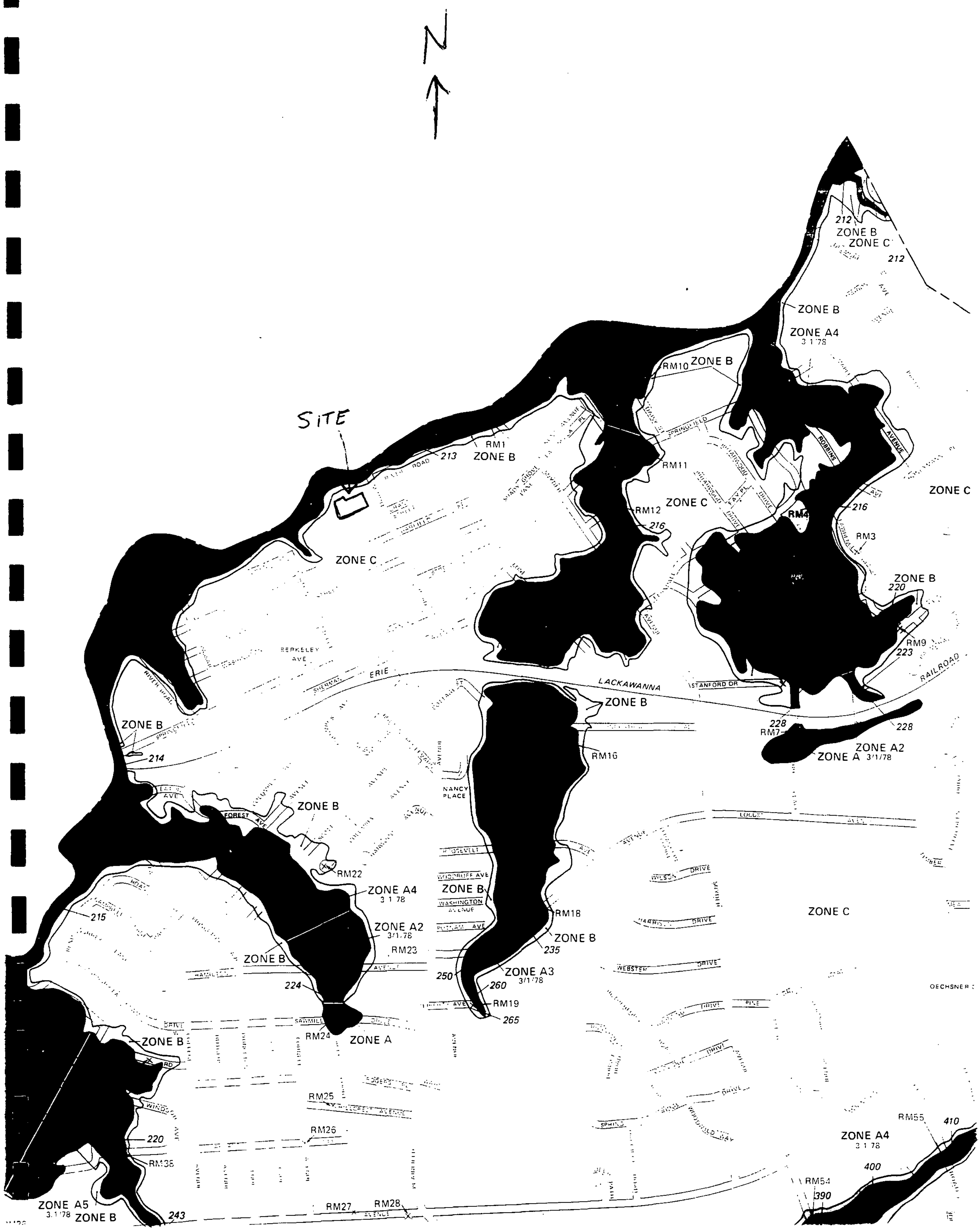
For description of elevation reference marks, see separately printed flood insurance study report.

Consult NFIA servicing company or local insurance agent or broker to determine if properties in this community are eligible for flood insurance.

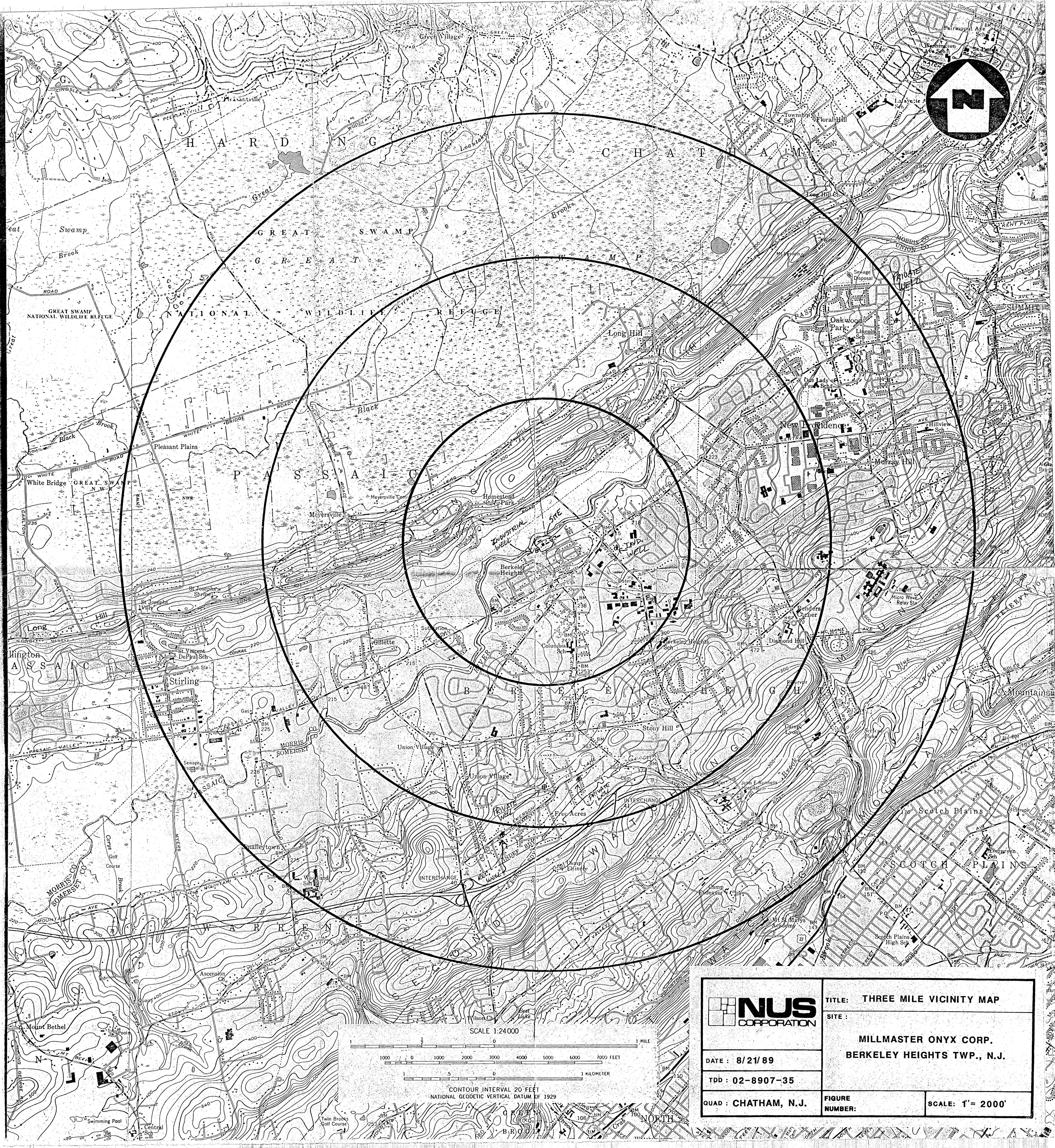
N

APPROXIMATE SCALE

800 0 800 FEET


N
SITE
ZONE B
ZONE C
ZONE A4
3/1/78
ZONE A2
3/1/78
ZONE A3
3/1/78
ZONE A5
3.1/78
ZONE A
RM1
RM3
RM4
RM7
RM9
RM10
RM11
RM12
RM16
RM18
RM19
RM22
RM23
RM24
RM25
RM26
RM27
RM28
RM36
RM54
RM55
212
213
214
215
216
220
223
224
228
235
243
250
260
265
390
400
410
LACKAWANNA
RAILROAD
ERIE
BERKELEY AVE
RIVER ROAD
FOREST AVE
NANCY PLACE
ROBBINS
AVENUE
SPRINGFIELD
STANFORD DR
ROOSEVELT
WOODRUFF AVE
WASHINGTON AVENUE
PUTNAM AVE
HAMILTON
WEBSTER DRIVE
WILSON DRIVE
HARRIS DRIVE
SAWMILL
WINDSOR AVE
OECHSNER

REFERENCE NO. 11



NUS CORPORATION

TITLE: THREE MILE VICINITY MAP

SITE:

MILLMASTER ONYX CORP.
BERKELEY HEIGHTS TWP., N.J.

DATE: 8/21/89

TDD: 02-8907-35

QUAD: CHATHAM, N.J.

FIGURE NUMBER:

SCALE: 1" = 2000'

REFERENCE NO. 12

NUS CORPORATION TELECON NOTE

CONTROL NO:	DATE:	TIME:
02-8907-35-$I	9/12/89	1530

DISTRIBUTION: TO FILE- MILLMASTER ONYX CORP.

BETWEEN:	OF:	PHONE:
SECRETARY FOR THE TOWN ENGINEER	BERKELEY HEIGHTS TWP.	(201) 665-0913

AND: Edmund Knyfd Jr. (NUS)

DISCUSSION:

I asked the secretary where Berkeley Heights gets their drinking water from. She stated their water comes from the North Jersey/American Water Co. She stated that approximately 3,479 homes, or 3800 homes/businesses total are served by this water. She stated that there are some private wells in use, for drinking, but did not know where they were located, and how many there are.

She said to call the plumbing inspector at 665-0512, between 8^30 and 9^00 am to get information about private wells, depth, location, etc.

Edmund Knyfd Jr.

9-12-89

ACTION ITEMS:

REFERENCE NO. 13

NUS CORPORATION TELECON NOTE

CONTROL NO:	DATE:	TIME:
02-8907-35-$I	9/12/89	1535 ~~pm~~ E.K. 9.12.89

DISTRIBUTION: TO FILE - MILLMASTER ONYX CORP.

BETWEEN:	OF:	PHONE:
Town Engineer	New Providence	(201) 665- ~~164~~ 1124 EK. 9.12.89

AND: Edmund Knyfd Jr. (NUS)

DISCUSSION:

The town engineer informed me that the ~~14~~ EK. 9.12.89 13,796 residents of New Providence get their drinking water from the Commonwealth Water Company. He said that private wells do exist and are used mainly for irrigation of lawns, etc. He did not know how many private wells there are, or any other specifics about these wells.

Edmund Knyfd Jr.

9-12-89

ACTION ITEMS:

NUS 067 REVISED 0681

REFERENCE NO. 14

NUS CORPORATION TELECON NOTE

CONTROL NO: 02-8907-35-$I	DATE: 9/12/89	TIME: 1545

DISTRIBUTION: TO FILE - MILLMASTER ONYX CORP. Page 1 of 2

BETWEEN: PAUL HARTELIUS - ENGINEER	OF: NEW JERSEY / AMERICAN WATER CO. (NORTHERN DIVISION)	PHONE: (201) 376-8800

AND: Edmund Knyfd, Jr. (NUS)

DISCUSSION:

I asked Paul what localities they serve in the site area; he said they serve Berkeley Heights, New Providence, Passaic Township, and Chatham Township with drinking water. The water supplies come from three different areas; basically:

- 25% is groundwater wells in the Summit + Short Hills, Millburn, and Springfield areas.

- 50% is purchased from the Elizabethtown Water Company; the water coming from Round Valley and Spruce Run Reservoirs.

- 25% comes from withdrawal from the Passaic River; three surface intakes are used and all are greater than

~~ACTION ITEMS:~~ 3 miles, upstream or downstream, from the site.

For the 25% of water supplied from wells, the wells in Millburn are roughly 125-150 feet deep; the ~~Summit/~~ Short Hills wells are roughly 85 feet deep; and the Summit wells are roughly 300-400 feet deep. The Summit

(see next page)

Edmund Knyfd Jr. 9-12-89

NUS CORPORATION TELECON NOTE

CONTROL NO: 02-8907-35-SI	DATE: 9/12/89	TIME: 1545

DISTRIBUTION:
TO FILE - MILLMASTER ONYX CORP.

BETWEEN: PAUL HARTELIUS - ENGINEER	OF: NEW JERSEY/AMERICAN WATER CO. (NORTHERN DIVISION)	PHONE: (201) 376-8800

AND: Edmund Knyfd, Jr. (NUS)

DISCUSSION: E.K. 9-12-89

wells are the closest to the site; located near ~~at~~ the intersection of Glenside ~~Road~~ Ave E.K. 9-12-89 and Route 78. This area has 5 wells which are located approximately 4.1 miles east/northeast of the site.

Edmund Knyfd Jr. 9-12-89

ACTION ITEMS:

NUS 067 REVISED 0581

REFERENCE NO. 15

NUS CORPORATION TELECON NOTE

CONTROL NO:	DATE:	TIME:
02-8907-35-$I	9/13/89	0835

DISTRIBUTION:

TO FILE - MILLMASTER ONYX CORP.

BETWEEN:	OF:	PHONE:
JACK FLOOD - PLUMBING INSPECTOR	BERKELEY HEIGHTS TWP	(201) 665-0512

AND:

Edmund Knyfd, Jr. (NUS)

DISCUSSION:

Jack Flood had indicated that the town does not use wells to supply public drinking water. He did indicate that there may be 12 to 15 private wells in use; he would check to see if there are wells in use for drinking water near the site; ie near Summit Ave and the Passaic River. He will get back to me with this information.

Edmund Knyfd Jr.

9-13-89

ACTION ITEMS:

NUS 067 REVISED 0581

REFERENCE NO. 16

40074-A1-EI-

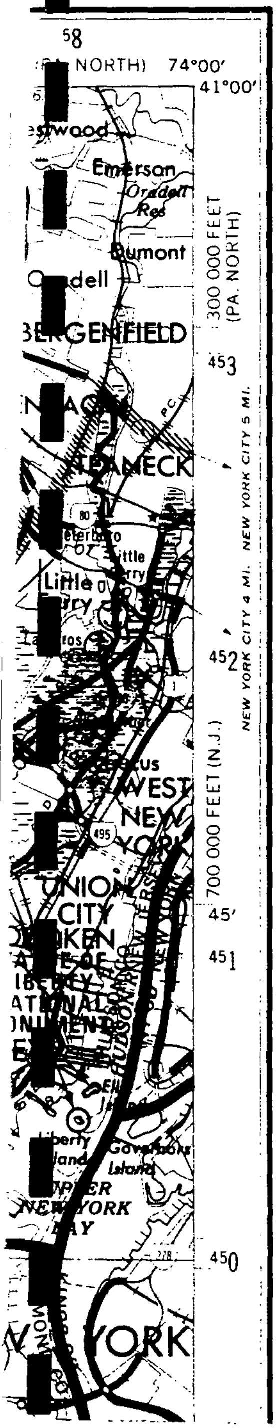
Newark

N. J.—N. Y.—PA.

1:250 000-scale map of

Atlantic Coast Ecological Inventory

Produced by
U. S. FISH AND WILDLIFE SERVICE
1980



TERRESTRIAL ORGANISMS

Shown in BROWN; species with special status shown in RED-(F) or (S) indicates species protected by Federal or State Legislation (see text)

SYMBOL — SPECIES

PLANTS (301-350)

301 Eastern hemlock
302 Spleenwort (S)
303 Spider lily (S)
304 Pond bush (S)
305 Watermilfoil (S)
306 Hooded pitcher plant (S)
307 Tree
308 Prickly pear cactus (S)
309 Trailing arbutus (S)
310 Eastern bumelia
311 Pitcher plant
312 Baldcypress
313 Redbay
314 Seaside alder
315 Box huckleberry
316 Purple fringeless orchid
317 Pink lady's slipper
318 Ebony spleenwort (S)
319 Orchids (S)
320 Golden club (S)
321 Florida beargrass
322 East-coast coontie
323 Fall-flowering ixia
324 Jackson-vine
325 Spoon-flower
326 Curtiss milkweed
327 Sea lavender
328 Hand fern
329 Needle palm
330 Yellow squirrel-banana
331 Beach creeper
332 Florida coontie
333 Four-petal pawpaw
334 Bird's nest spleenwort
335 Burrowing four-o'clock
336 Beach star
337 Silver palm
338 Dancing lady orchid
339 Tamarindillo
340 Fuch's bromeliad
341 Everglades peperomia
342 Buccaneer palm
343 Slender spleenwort
344 Pineland jacquemontia
345 Mahogany mistletoe
346 Florida thatch
347 Twisted air plant
348 Long's bittercress
349 Venus's flytrap

INVERTEBRATES (351-400)

351 Monarch butterfly
352 Zebra butterfly

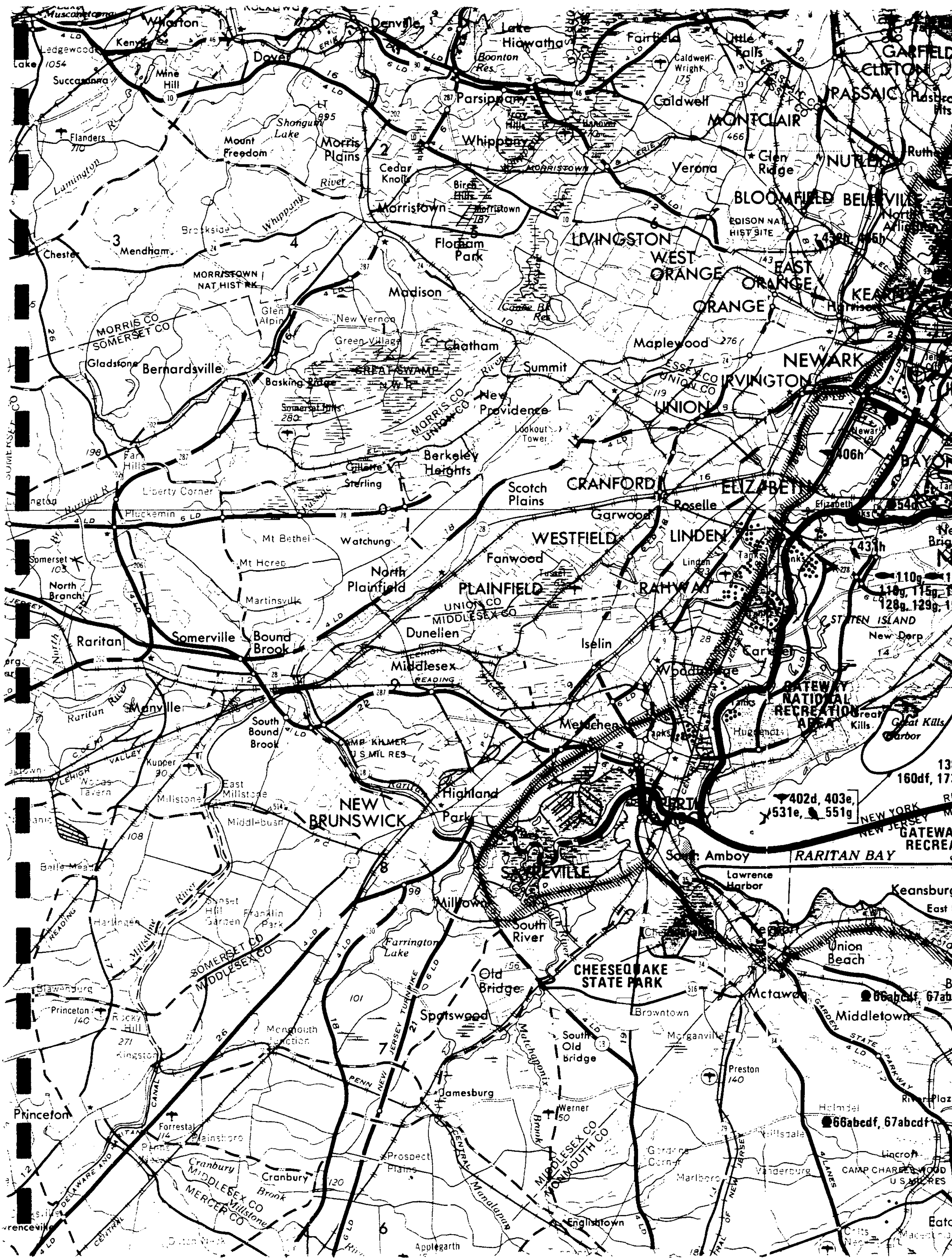
BIRDS (401-600)

SHOREBIRDS (401-430)

401 Shorebirds
402 Terns
403 Gulls
404 Forster's tern
405 Arctic tern
406 Least tern (S)
407 Roseate tern (S)
408 Common tern
409 Great black-backed gull
410 Herring gull
411 Laughing gull
412 Black skimmer (S)
413 Turnstones
414 Plovers
415 Piping plover
416 American oystercatcher (S)

WADING BIRDS (431-460)

431 Wading birds
432 Herons
433 Egrets
434 Rails



Wharton
Denville
Lake Hiawatha
Fairfield
Little Falls
GARFIELD
CLIFTON
PASSAIC
Ledgewood
Kenvil
Dover
Mine Hill
Succasunna
Boonton Res.
Parsippany
Caldwell
Caldwell-Wright
175
MONTCLAIR
Flanders
710
Shongum Lake
Mount Freedom
Morris Plains
Whippany
Cedar Knolls
Glen Ridge
Verona
NUTLEY
Lamington
River
Whippany
Morristown
Birch Hills
Morristown
187
BLOOMFIELD
BELLEVILLE
EDISON NAT HIST SITE
Brookside
Chester
Mendham
Florham Park
LIVINGSTON
WEST ORANGE
EAST ORANGE
MORRISTOWN NAT HIST PK
Madison
ORANGE
Glen Alpine
New Vernon
Green Village
Chatham
MORRIS CO
SOMERSET CO
Maplewood
276
NEWARK
Gladstone
Bernardsville
Basking Ridge
GREAT SWAMP N W R
Summit
ESSEX CO
UNION CO
IRVINGTON
Somerset Hills
280
MORRIS CO
UNION CO
New Providence
UNION
Far Hills
Lookout Tower
Berkeley Heights
Gillette
Sterling
Scotch Plains
CRANFORD
ELIZABETH
Liberty Corner
Raritan R
Pluckemin
Roselle
Garwood
Mt Bethel
Watchung
WESTFIELD
LINDEN
Somerset
105
Mt Horeb
Fanwood
Linden
North Plainfield
PLAINFIELD
RAHWAY
North Branch
Martinsville
UNION CO
MIDDLESEX CO
STATEN ISLAND
New Dorp
Raritan
Somerville
Bound Brook
Dunellen
Iselin
Carteret
Middlesex
Woodbridge
GATEWAY NATIONAL RECREATION AREA
Manville
Raritan River
South Bound Brook
Metuchen
Great Kills
Great Kills Harbor
CAMP KILMER U S MIL RES
Kupper
90
East Millstone
Millstone
Highland Park
NEW BRUNSWICK
Middlebush
Belle Mead
RARITAN BAY
South Amboy
SAYREVILLE
Lawrence Harbor
Keansburg
Sunset Hill Garden
Franklin Park
Milltown
South River
Farrington Lake
Harlingen
Union Beach
SOMERSET CO
MIDDLESEX CO
Old Bridge
CHEESEQUAKE STATE PARK
Blawenburg
Princeton
140
Rocky Hill
Spotswood
Browntown
Middletown
Matawan
Monmouth Junction
Kingston
South Old Bridge
Morganville
Preston
140
Jamesburg
Princeton
Forrestal
14
Plainsboro
Werner
50
MIDDLESEX CO
MONMOUTH CO
Holmdel
Prospect Plains
Cranbury
Cranbury Brook
Manalapan
Lincroft
Marlboro
CAMP CHARLES WOOD U S MIL RES
MIDDLESEX CO
MERCER CO
Millstone
Englishtown
Applegarth
NEW JERSEY TURNPIKE
GARDEN STATE PARKWAY
NEW YORK
NEW JERSEY

REFERENCE NO. 17

Surface Water Classifications

Surface Water Quality Standards
N.J.A.C. 7:9-4

May 1985

State of New Jersey Department of Environmental Protection/Division of Water Resources

6. All waterways or waterbodies, or portions of waterways and waterbodies that are classified as PL only for those portions that are located within the boundaries of the Pinelands Area are classified as PL unless they are listed as FW1 waters in Index A. A tributary entering a PL stream is classified as PL only for those portions of the tributary that are within the Pinelands Area. Lakes are classified as PL only if they are located entirely within the Pinelands Area.

CLASSIFICATIONS:

FW1
FW2-TP -- FW2 Trout Production
FW2-TM -- FW2 Trout Maintenance
FW2-NT -- FW2 Non Trout
PL -- Pinelands Waters
SE1
SE2
SE3
SC
FW2-NT/SE1 (or similar designation) -- Indicates a waterway in which there may be a salt water/fresh water interface. The exact point of demarcation between the fresh and saline waters must be determined by salinity measurements and is that point where the salinity reaches 3.5 parts per thousand at mean high tide. The stream is classified as FW2-NT in the fresh portions (salinity less than or equal to 3.5 parts per thousand at mean high tide) and SE1 in the saline portions.

DESIGNATIONS:

(C1) -- Category 1 waters
[tp] -- Indicates trout production in waters which are classified as FW1; this is for information only and does not affect the water quality criteria for any stream
[tm] -- Indicates trout maintenance in waters which are classified as PL or FW1. For FW1 this is for information only and does not affect the water quality criteria for any stream.

Surface Water Classifications

Surface Water Quality Standards
N.J.A.C. 7:9-4

Index D-
Surface Water Classifications of the Passaic, Hackensack and N.Y. Harbor Complex Basin

July 1985

State of New Jersey Department of Environmental Protection/Division of Water Resources

(Stockholm) - Brook between Hamburg Turnpike and Williamsville-Stockholm Rd. to its confluence with Lake Stockholm Brook, north of Rt. 23	FW1 [tm]
LITTLE POND BROOK (Oakland) - Entire length	FW2-TP(C1)
LOANTAKA BROOK	
(Green Village) - Entire length, except segment described below	FW2-NT
(Great Swamp) - Brook and all tributaries within the boundaries of Great Swamp National Wildlife Refuge	FW2-NT(C1)
LUD-DAY BROOK	
(Camp Garfield) - Source to confluence with a tributary from Camp Garfield	FW1
MACOPIN RIVER	
(Newfoundland) - Source to Echo Lake dam	FW2-NT
(Newfoundland) - Echo Lake dam to Pequannock River	FW2-TM
MEADOW BROOK (Wanaque) - Skyline Lake to Wanaque River	FW2-NT
MILL BROOK	
(Randolph) - Source to Rt. 10 bridge	FW2-TP(C1)
(Randolph) - Rt. 10 bridge to Rockaway River	FW2-NT
MORSES CREEK - Entire length	FW2-NT/SE3
MOSSMAN'S BROOK - See CLINTON BROOK	
MT. TABOR BROOK (Morris Plains) - Entire length	FW2-NT
NEWARK BAY (Newark) - North of an east-west line connecting Elizabethport with Bergen Pt., Bayonne up to the mouths of the Passaic and Hackensack Rivers	SE3
NOSENZO POND (Upper Macopin)	FW2-NT(C1)
OAK RIDGE RESERVOIR (Oak Ridge)	FW2-TM
OAK RIDGE RESERVOIR (Oak Ridge) - Northwestern tributary to Reservoir	FW1 [tm]
OVERPECK CREEK (Palisades Park) - Entire length	FW2-NT/SE2
PECKMAN RIVER (Verona) - Entire length	FW2-NT
PACACK BROOK	
(Stockholm) - Source to Pequannock River, excluding Canistear Reservoir, except segments described separately below	FW2-NT
(Canistear) - Brook and tributaries upstream of Canistear Reservoir located entirely within the boundaries of the Newark Watershed	FW1
PASSAIC RIVER	
(Mendham) - Source to Rt. 202 bridge (Van Doren's Mill), except tributaries described separately below	FW2-TM
(Paterson) - Rt. 202 bridge to Dundee Lake dam	FW2-NT
(Little Falls) - Dundee Lake dam to confluence with Second River	FW2-NT/SE2
(Newark) - Confluence with Second River to mouth	SE3

REFERENCE NO. 18

Surface Water
Quality Standards

SURFACE WATER QUALITY STANDARDS

N.J.A.C. 7:9-4.1 et seq.

May 1985

New Jersey Department of Environmental Protection/Division of Water Resources

(c) In all FW2 waters the designated uses are:

1. Maintenance, migration and propagation of the natural and established biota;

2. Primary and secondary contact recreation;

3. Industrial and agricultural water supply;

4. Public potable water supply after such treatment as required by law or regulation; and

5. Any other reasonable uses.

(d) In all SE1 waters the designated uses are:

1. Shellfish harvesting in accordance with N.J.A.C. 7:12;

2. Maintenance, migration and propagation of the natural and established biota;

3. Primary and secondary contact recreation; and

4. Any other reasonable uses.

(e) In all SE2 waters the designated uses are:

1. Maintenance, migration and propagation of the natural and established biota;

2. Migration of diadromous fish;

3. Maintenance of wildlife;

4. Secondary contact recreation; and

5. Any other reasonable uses.

(f) In all SE3 waters the designated uses are:

1. Secondary contact recreation;

2. Maintenance and migration of fish populations;

3. Migration of diadromous fish;

4. Maintenance of wildlife; and

5. Any other reasonable uses.

(g) In all SC waters the designated uses are:

1. Shellfish harvesting in accordance with N.J.A.C. 7:12;

REFERENCE NO. 19

NUS CORPORATION **TELECON NOTE**

CONTROL NO: 028907-35-$I	DATE: 9/18/89	TIME: 1540

DISTRIBUTION: TO FILE - MILLMASTER ONYX CORP.

BETWEEN: PAUL HARTELIUS - ENGINEER	OF: NEW JERSEY/AMERICAN WATER Co. (NORTHERN DIVISION)	PHONE: (201) 376-8800

AND: Edmund Knyfd, Jr. (NUS)

DISCUSSION:

I asked Paul if NJ/American Water Co. owned a well in Stirling; and if it was used for public supply drinking. He said they do own it (formerly known as Elmi Water Co.) and it serves only 20 or so people. A very small well; he did not know much about it.

Edmund Knyfd Jr. 9/18/89

ACTION ITEMS:

NUS 067 REVISED 0581

REFERENCE NO. 20

NUS CORPORATION **TELECON NOTE**

CONTROL NO:	DATE:	TIME:
02-8907-35-$I	9/18/89	1605

DISTRIBUTION: TO FILE - MILLMASTER ONYX CORP.

BETWEEN:	OF:	PHONE:
DR. SABLE - WATCHUNG HILLS REGIONAL H.S. - BOARD of ED.	BOARD OF EDUCATION	(201) 647-4850

AND: Edmund Knyfd Jr. (NUS)

DISCUSSION:

I asked Dr. Sable about the use of the public supply well owned by the Watchung Hills Regional High School. He indicated that it was used for irrigation purposes only; lawn watering of the school grounds, and football / baseball fields. It is not used for drinking water at the school. A Mr. Harry Kozell of the Bldg. and Grounds department may have more info on the well. His number is 647-4810.

Edmund Knyfd Jr. 9-18-89

ACTION ITEMS:

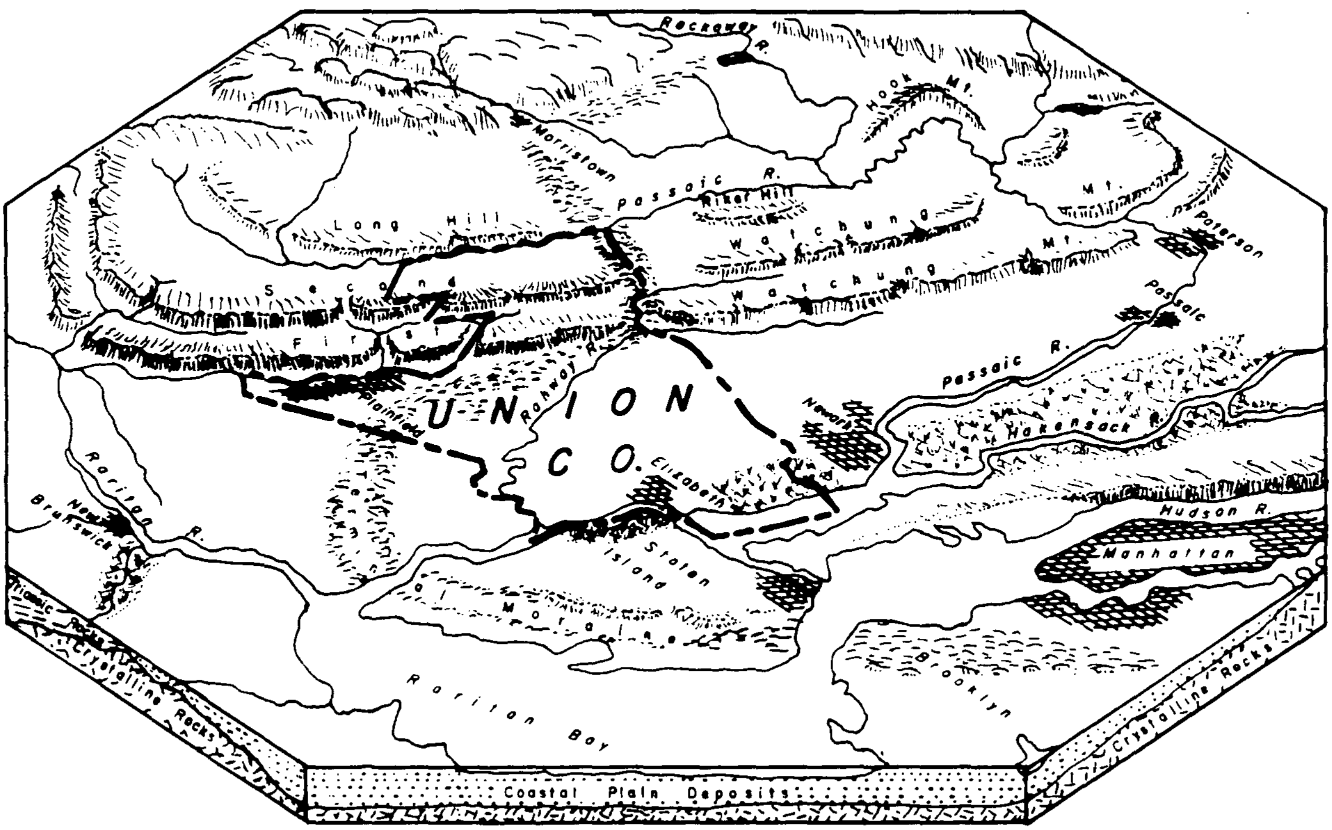
NUS 067 REVISED 0681

REFERENCE NO. 21

GEOLOGY AND GROUND-WATER RESOURCES OF UNION COUNTY, NEW JERSEY

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations 76–73



Prepared in cooperation with

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER RESOURCES

GEOLOGY AND GROUND-WATER RESOURCES OF UNION COUNTY, NEW JERSEY

By Bronius Nemickas

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations 76–73

Prepared in cooperation with

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER RESOURCES

June 1976

Table 4.--Records of selected wells in Union County, New Jersey

EXPLANATION

1. Location

404114N0742607.1 Sequential number 1 is given to the first well for which a record is obtained. Additional wells at the same location are numbered sequentially.

Latitude	Longitude
40°41'14'N	74°26'07"

2. Aquifer

- R3 Upper Triassic
- BR Brunswick Formation
- W1 1st Watchung Flow
- W2 2nd Watchung Flow
- QG Quaternary, Pleistocene
- OO Glacial Outwash, Undifferentiated

3. Water level below land surface

- F Flows

4. Pumping period

- A Less than 1 hour

5. Water use

- A Air condition
- C Commercial
- H Domestic
- I Irrigation
- N Industrial
- P Public Supply
- R Recreation
- U Unused
- W Recharge
- Z Other

Table 4.--Records of selected wells in Union County, New Jersey

LOCATION NUMBER ON MAP IN FIGURE 2	LOCATION	MUNICIPALITY	OWNER	LOCAL WELL NUMBER	DATE DRILLED (YEAR)	ALTITUDE OF LSD (FT.)	WELL DEPTH (FT.)
1	404114N0742607.1	BERKELEY HEIGHTS	ALMA PHARMAC	REHEIS 4	1965	210	303
2	404113N0742641.1	BERKELEY HEIGHTS	BERKELEY CHEM C	BERK CHEM 3	1956	210	200
3	404059N0742559.1	BERKELEY HEIGHTS	ALMA PHARMAC	REHEIS 3	1956	220	255
4	404058N0742557.1	BERKELEY HEIGHTS	ALMA PHARMAC	REHEIS 1	1949	235	160
5	404056N0742559.1	BERKELEY HEIGHTS	ALMA PHARMAC	REHEIS 2	1956	235	317
6	404018N0742638.1	BERKELEY HEIGHTS	W C SOPER	SOPER	1961	415	198
7	403946N0742621.1	BERKELEY HEIGHTS	H ROGERS	ROGERS	1948	420	283
8	403927N0742659.1	BERKELEY HEIGHTS	EMERSON CO CLUB	CLUB 1	1951	440	130
1	403801N0741826.1	CLARK TWP	GENERAL MOTORS	HYATT 3	1953	65	504
2	403759N0741832.1	CLARK TWP	GENERAL MOTORS	HYATT 1	1940	68	501
2	403759N0741832.2	CLARK TWP	GENERAL MOTORS	HYATT 2	1944	65	505
3	403754N0741816.1	CLARK TWP	U S GYPSUM CO	US GYP 2	--	70	300
4	403746N0741819.1	CLARK TWP	U S GYPSUM CO	US GYP 1	1946	70	505
5	403745N0741902.1	CLARK TWP	FIBRO CORP	FIBRO 3	1960	75	250
6	403744N0741903.1	CLARK TWP	FIBRO CORP	FIBRO 1	1957	75	250
7	403743N0741902.1	CLARK TWP	FIBRO CORP	FIBRO 2	--	60	250
8	403720N0741828.1	CLARK TWP	WM KELEMEN	KELEMEN	1957	70	100
9	403719N0741802.1	CLARK TWP	A FRANZISCO	FRANZISCO	1955	70	98
10	403717N0741751.1	CLARK TWP	J DWOYER	DWOYER	1958	70	106
11	403711N0741914.1	CLARK TWP	J WYZYNSKI	WYZYNSKI	1951	55	92
12	403709N0741800.1	CLARK TWP	FRANCIS MARTIN	MARTIN	1959	60	160
13	403707N0741919.1	CLARK TWP	PAUL MITRO	MITRO	1957	60	114
14	403701N0741904.1	CLARK TWP	S MURACH	MURACH	1956	76	133
15	403659N0741919.1	CLARK TWP	D E BREWER	BREWER	1951	85	94
16	403656N0741849.1	CLARK TWP	H NUHN	NUHN	1935	100	208
17	403640N0742000.1	CLARK TWP	W A RATH	RATH	1954	85	108
18	403630N0741842.1	CLARK TWP	BRUNO ENCHURA	ENCHURA	1958	80	100
19	403629N0741853.1	CLARK TWP	NJ HIGHWAY	HIGH 1	1952	90	150
20	403622N0742019.1	CLARK TWP	F LANZA	LANZA	1951	70	75
1	404025N0741920.1	CRANFORD TWP	CRANFORD POOL A	SWIM POOL 1	1954	90	155

Table 4.--Records of selected wells in Union County, New Jersey--Continued

LOCATION NUMBER ON MAP IN FIGURE 2	DEPTH TO CONSL. ROCK (FT.)	CASING DIAM-ETER (IN.)	CASING DEPTH (FT.)	MAJOR AQUIFER	WATER LEVEL (FT.)	DATE WATER LEVEL MEAS.	YIELD (GPM)	DRAW DOWN (FT.)	SPECIFIC CAPACITY	PUMPING PERIOD (HOURS)	USE OF WATER
1	41	8	41	R3 BR	65	12-65	270	10	27.0	8	A
2	67	8	67	R3 BR	15	7-56	80	175	0.5	8	N
3	48	8	48	R3 BR	18	2-56	192	147	1.3	8	N
4	--	8	--	R3 BR	--	--	250	80	3.1	--	N
5	52	10	52	R3 BR	24	2-56	62	176	0.4	8	N
6	28	5	28	R3 --	1	1-61	4	179	0.0	1	H
7	3	6	24	R3 W1	30	10-48	1	130	0.0	2	--
8	56	8	56	R3 W1	4	--	25	21	1.2	8	R
1	26	12	33	R3 BR	41	1-53	660	46	14.3	27	N
2	38	16	--	R3 BR	29	3-40	450	114	3.9	--	N
2	28	10	35	R3 BR	40	12-44	500	20	25.0	36	N
3	--	12	--	R3 BR	--	--	--	--	--	--	N
4	46	12	49	R3 BR	25	4-48	536	51	10.5	24	N
5	65	8	73	R3 BR	20	6-60	70	23	3.0	8	N
6	50	8	67	R3 BR	19	9-57	75	30	2.5	8	N
7	--	8	--	R3 BR	--	--	--	--	--	--	U
8	65	6	78	R3 BR	35	11-57	15	7	2.1	--	H
9	76	6	76	R3 BR	35	11-55	8	11	0.7	--	H
10	83	6	83	R3 BR	40	12-58	15	2	7.5	--	H
11	42	6	52	R3 BR	15	11-51	10	45	0.2	2	H
12	70	6	73	R3 BR	28	5-59	30	6	5.0	--	H
13	45	6	47	R3 BR	20	10-57	8	15	0.5	--	H
14	61	6	61	R3 BR	42	1-56	14	45	0.3	--	H
15	54	6	54	R3 BR	--	--	20	--	--	2	H
16	70	6	85	R3 BR	60	9-35	5	30	0.2	6	H
17	33	6	36	R3 BR	12	3-54	15	10	1.5	--	H
18	20	6	21	R3 BR	21	10-58	15	7	2.1	--	H
19	42	--	42	R3 BR	35	5-52	10	25	0.4	4	--
20	16	6	--	R3 BR	10	-51	10	--	--	--	H
1	44	8	48	R3 BR	30	6-54	50	50	1.0	4	R

Table 4.--Records of selected wells in Union County, New Jersey--Continued

LOCATION NUMBER ON MAP IN FIGURE 2	LOCATION	MUNICIPALITY	OWNER	LOCAL WELL NUMBER	DATE DRILLED (YEAR)	ALTI-TUDE-OF LSD (FT.)	WELL DEPTH (FT.)
28	403734N0741551.1	LINDEN CITY	AUTO IJECT MOLD	AUTO MOLD 1	1967	35	250
29	403728N0741553.1	LINDEN CITY	GENERAL GUM PD	GEN GUM 2	1957	35	310
30	403728N0741528.1	LINDEN CITY	NESCO STEEL	NESCO 2	1937	20	208
31	403725N0741622.1	LINDEN CITY	HATFIELD WIRE	HATFIELD 1	1958	35	175
32	403723N0741437.1	LINDEN CITY	J MARTINAITISS	MARTINAITISS	1953	15	110
33	403722N0741541.1	LINDEN CITY	NESCO STEEL	NESCO 1	1949	30	266
34	403714N0741341.1	LINDEN CITY	STANDARD OIL CO	STAN OIL	1920	15	1556
35	403713N0741543.1	LINDEN CITY	LAYNE N Y CO	LAYNE 1	1955	30	308
36	403711N0741501.1	LINDEN CITY	DISTILLERS CO	DISTILLERS 1	1934	25	316
36	403711N0741501.2	LINDEN CITY	DISTILLERS CO	DISTILLERS 2	1934	25	307
37	403705N0741531.1	LINDEN CITY	W MELENCLUK	MELENCLUK	1952	25	96
38	403653N0741505.1	LINDEN CITY	BABB CO	BABB 1	1950	20	300
1	404114N0742039.1	MOUNTAINSIDE BORO	ELIZABETHTOWN W	PLAIN DIV 1	1951	150	454
2	404110N0742043.1	MOUNTAINSIDE BORO	ELIZABETHTOWN W	PLAIN DIV 2	1953	150	572
3	404105N0742021.1	MOUNTAINSIDE BORO	ELIZABETHTOWN W	SPRINGFIELD AV	1960	145	315
4	404104N0742036.1	MOUNTAINSIDE BORO	W E EITNER	EITNER 1	1952	140	189
5	404102N0742011.1	MOUNTAINSIDE BORO	ECKO LK HOLD CO	ECKO LAKE 1	1951	145	400
6	404101N0742222.1	MOUNTAINSIDE BORO	UNION CO PARK	PARK GS1	1931	430	365
7	404100N0742032.1	MOUNTAINSIDE BORO	STERLING PLAS C	STER PLAS GS2	1963	145	456
8	404100N0742025.1	MOUNTAINSIDE BORO	STERLING PLAS C	STER PLAS GS1	1966	150	590
9	404051N0742032.1	MOUNTAINSIDE BORO	P DE VESA	DE VESA 1	1949	138	85
10	404048N0742020.1	MOUNTAINSIDE BORO	BEST WAY PROD C	BEST WAY 1	1956	145	275
10	404048N0742020.2	MOUNTAINSIDE BORO	BEST WAY PROD C	BEST WAY 2	1968	145	475
11	404046N0742104.1	MOUNTAINSIDE BORO	ELIZABETHTOWN W	CENTRAL AVE	1960	140	300
12	404046N0741956.1	MOUNTAINSIDE BORO	MINDOWASKIN CO	MINDOWASKIN	1954	95	197
13	404042N0742040.1	MOUNTAINSIDE BORO	A K TOOL CO	AK TOOL 1	1953	140	300
14	404028N0742109.1	MOUNTAINSIDE BORO	K GLASSTETTER	GLASSTETTER	1958	170	110
15	404010N0742246.1	MOUNTAINSIDE BORO	A FREEMAN	FREEMAN 1	1958	210	150
1	404246N0742316.1	NEW PROVIDENCE BO	W E CLOSS	CLOSS 1	1960	315	512
2	404235N0742352.1	NEW PROVIDENCE BO	NILS J AHL	AHL	1954	255	155

Table 4.--Records of selected wells in Union County, New Jersey--Continued

Table 4.--Records of selected wells in Union County, New Jersey--Continued

LOCATION NUMBER ON MAP IN FIGURE 2	DEPTH TO CONSL. ROCK (FT.)	CASING DIAM-ETER (IN.)	CASING DEPTH (FT.)	MAJOR AQUIFER	WATER LEVEL (FT.)	DATE WATER LEVEL MEAS.	YIELD (GPM)	DRAW DOWN (FT.)	SPECIFIC CAPACITY	PUMPING PERIOD (HOURS)	USE OF WATER
28	22	6	29	R3 BR	34	11-67	75	10	7.5	8	N
29		8	86	R3 BR	15	3-57	90	35	2.6	9	N
30	35	--	--	R3 BR	15	-37	50	--	--	--	--
31	18	12	40	R3 BR	8	10-58	40	142	0.3	8	U
32	25	6	32	R3 BR	12	8-53	15	8	1.9	4	H
33	37	8	42	R3 BR	25	8-49	25	148	0.2	5	N
34	15	--	--	R3 BR	22	9-20	--	--	--	--	--
35	30	8	36	R3 BR	20	2-55	30	100	0.3	6	--
36	34	12	--	R3 BR	5	-34	65	115	0.6	8	N
36	35	12	--	R3 BR	3	-34	23	119	0.2	8	N
37	35	6	40	R3 BR	12	8-52	5	--	--	1	H
38	30	8	31	R3 BR	5	4-50	80	100	0.8	--	C
1	50	10	55	R3 BR	6	6-51	504	48	10.5	48	P
2	75	12	79	R3 BR	23	11-53	221	127	1.7	24	P
3	50	12	65	R3 BR	35	5-60	328	118	2.8	48	P
4	40	6	40	R3 BR	30	9-52	4	150	0.0	3	H
5	60	10	67	R3 BR	25	3-51	180	122	1.5	6	A
6	51	8	61	R3 W1	33	6-31	20	83	0.2	8	--
7	30	10	59	R3 BR	22	1-63	275	89	3.1	8	N
8	58	10	60	R3 BR	69	8-66	214	90	2.4	8	N
9	38	6	42	R3 BR	25	7-49	10	32	0.3	--	H
10	130	8	130	R3 BR	65	7-56	65	20	3.2	8	N
10	100	8	115	R3 BR	73	10-68	125	92	1.4	8	N
11	35	12	43	R3 BR	12	2-60	457	83	5.5	48	P
12	48	6	48	R3 BR	25	6-54	65	35	1.9	8	R
13	79	6	84	R3 BR	58	9-53	111	92	1.2	6	N
14	41	6	41	R3 BR	32	7-58	15	4	3.7	--	H
15	78	6	85	R3 BR	65	6-58	20	13	1.5	5	I
1	223	10	225	R3 BR	170	5-60	220	52	4.2	9	H
2	125	6	125	R3 BR	30	3-54	15	10	1.5	4	H

Table 4.--Records of selected wells in Union County, New Jersey--Continued

LOCATION NUMBER ON MAP IN FIGURE 2	LOCATION	MUNICIPALITY	OWNER	LOCAL WELL NUMBER	DATE DRILLED (YEAR)	ALTI- TUDE- OF LSD (FT.)	WELL DEPTH (FT.)
3	404222N0742310.1	NEW PROVIDENCE BO	CLEARWATER CLUB	CLEAR 1	1954	263	196
4	404157N0742318.1	NEW PROVIDENCE BO	F R PORKER	PORKER	1954	320	77
5	404147N0742405.1	NEW PROVIDENCE BO	AZOPLATE CORP	AZO 1	1962	230	310
6	404128N0742432.1	NEW PROVIDENCE BO	FABLOK INC	SPRING IND 1	1962	260	200
1	403757N0742355.1	PLAINFIELD CITY	ELIZABETHTOWN W	ROCK WELL 13	1950	130	803
2	403750N0742402.1	PLAINFIELD CITY	WIGTON ABBOTT C	WIGTON GS 1	1966	125	400
3	403719N0742523.1	PLAINFIELD CITY	L BAMBERGER CO	BAMBERGER B	1953	100	44
4	403718N0742521.1	PLAINFIELD CITY	L BAMBERGER CO	RECHARGE 1	1953	100	34
4	403718N0742521.2	PLAINFIELD CITY	L BAMBERGER CO	BAMBERGER A	1953	100	43
5	403717N0742521.1	PLAINFIELD CITY	L BAMBERGER CO	RECHARGE 2	1953	100	44
6	403716N0742518.1	PLAINFIELD CITY	L BAMBERGER CO	SUPPLY WELL 1	1952	100	501
6	403716N0742518.2	PLAINFIELD CITY	L BAMBERGER CO	BAMBERGER 4	1953	100	37
6	403716N0742518.3	PLAINFIELD CITY	L BAMBERGER CO	BAMBERGER 3	1953	100	44
6	403716N0742518.4	PLAINFIELD CITY	L BAMBERGER CO	BAMBERGER 7	1953	100	34
6	403716N0742518.5	PLAINFIELD CITY	L BAMBERGER CO	BAMBERGER 6	1953	100	43
7	403711N0742515.1	PLAINFIELD CITY	S ROSENBAUM	ROSENBAUM 1	1950	100	301
8	403708N0742349.1	PLAINFIELD CITY	ELIZABETHTOWN W	WATCHUNG AVE	1959	165	605
9	403705N0742532.1	PLAINFIELD CITY	TEPPER BROS	TEPPER 1	1950	90	427
10	403656N0742337.1	PLAINFIELD CITY	ELIZABETHTOWN W	PROSPECT ST	1960	160	350
11	403654N0742514.1	PLAINFIELD CITY	QUEEN CITY BOT	QUEEN CITY 1	1949	97	310
12	403652N0742508.1	PLAINFIELD CITY	SAFEWAY STORES	SAFEWAY 1	1951	95	303
13	403643N0742442.1	PLAINFIELD CITY	HYMAN OKUM	OKUN 1	1952	105	130
14	403634N0742524.1	PLAINFIELD CITY	H TAUB	TAUB 1	1953	90	200
15	403625N0742417.1	PLAINFIELD CITY	MUHLENBERG HOSP	MUHLENBERG 3	1962	95	502
16	403600N0742656.1	PLAINFIELD CITY	INT PLNFLD MOTR	INT MOTOR 2	1948	60	600
17	403554N0742628.1	PLAINFIELD CITY	ELIZABETHTOWN W	FIFTH ST WELL	1965	70	350
18	403550N0742716.1	PLAINFIELD CITY	NAT STARCH PROD	NATIONAL 6	1964	60	436
19	403548N0742718.1	PLAINFIELD CITY	NAT STARCH PROD	NATIONAL 1	1950	60	304
20	403546N0742723.1	PLAINFIELD CITY	NAT STARCH PROD	NATIONAL 2	1950	60	304
1	403728N0741636.1	RAHWAY CITY	TINGLEY RUBER C	TINGLEY GS 1	1932	40	222

Table 4.--Records of selected wells in Union County, New Jersey--Continued

LOCATION NUMBER ON MAP IN FIGURE 2	DEPTH TO CONSL. ROCK (FT.)	CASING DIAM-ETER (IN.)	CASING DEPTH (FT.)	MAJOR AQUIFER	WATER LEVEL (FT.)	DATE WATER LEVEL MEAS.	YIELD (GPM)	DRAW DOWN (FT.)	SPECIFIC CAPACITY	PUMPING PERIOD (HOURS)	USE OF WATER
3	33	8	50	R3 W2	8	3-54	99	39	2.5	8	--
4	14	6	14	R3 W2	13	1-54	8	27	0.3	4	H
5	45	8	46	R3 BR	30	7-62	128	157	0.8	8	N
6	20	8	49	R3 W2	20	1-62	164	66	2.5	8	N
1	90	12	91	R3 BR	88	7-50	119	202	0.6	24	U
2	58	10	82	R3 BR	81	6-66	201	134	1.5	8	N
3	30	6	34	R3 BR	--	--	--	--	--	--	U
4	33	17	17	QG 00	21	-53	--	--	--	--	W
4	43	6	36	QG 00	--	--	--	--	--	--	U
5	40	22	23	QG 00	--	--	--	--	--	--	W
6	48	12	53	R3 BR	26	9-52	200	94	2.1	8	C
6	35	6	35	R3 BR	--	--	--	--	--	--	U
6	40	6	40	R3 BR	--	--	--	--	--	--	U
6	31	6	31	R3 BR	--	--	--	--	--	--	U
6	39	6	39	R3 BR	--	--	--	--	--	--	U
7	40	10	45	R3 BR	80	2-50	230	70	3.3	8	A
8	114	12	114	R3 BR	101	3-59	350	81	4.3	41	P
9	40	12	42	R3 BR	16	4-50	560	84	6.7	24	N
10	105	12	114	R3 BR	91	1-60	328	103	3.2	24	P
11	37	8	53	R3 BR	55	3-49	146	69	2.1	24	U
12	25	8	44	R3 BR	33	5-51	80	70	1.1	8	A
13	80	6	83	R3 BR	15	12-52	25	45	0.6	5	H
14	63	6	63	R3 BR	25	4-53	15	7	2.1	1	A
15	47	12	54	R3 BR	48	6-62	137	146	0.9	24	--
16	60	8	67	R3 BR	8	7-48	257	152	1.7	8	N
17	80	12	84	R3 BR	35	6-65	300	165	1.8	8	P
18	61	10	72	R3 BR	25	2-64	380	17	22.4	--	N
19	64	10	65	R3 BR	17	1-50	400	24	16.7	24	N
20	60	10	66	R3 BR	12	2-50	320	78	4.1	24	N
1	38	8	--	R3 BR	--	--	120	--	--	--	U

Table 6.--Logs of Selected Wells in Union County, New Jersey

Representative well log in the Township of Berkeley Heights

Well 7

Owner: Mr. H. Rogers
Owners well number: Rogers
Lat. 403926N Long. 0742621
Altitude, 420 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Till	3	3
Triassic (Watchung Basalt):		
Basalt	280	283

Representative well logs in Clark Township

Well 2

Owner: General Motor Corp.
Owners well number: Hyatt 2
Lat. 403759N Long. 0741832
Altitude, 65 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Till	28	28
Triassic (Brunswick Formation)		
Shale, weathered	162	190
Sandstone, argillaceous, fine-grained	128	318
Shale	100	418
Sandstone, argillaceous, fine-grained; some shale	42	460
Shale	45	505

Table 6.--Logs of Selected Wells in Union County, New Jersey--Continued

Representative well logs in the Boro of Mountainside--Continued

Well 13

Owner: A. K. Tool Co.
Owners well number: AK Tool 1
Lat. 404042N Long. 0742040
Altitude, 140 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Sand and gravel	20	20
Sand and clay	59	79
Triassic (Brunswick Formation):		
Shale, red	221	300

Representative well logs in the New Providence Boro

Well 1

Owner: Mr. W. Closs
Owners well number: Closs 1
Lat. 404246N Long. 0742316
Altitude, 315 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Sand	53	53
Clay, sand, and gravel	107	160
Clay	63	223
Triassic (Brunswick Formation):		
Shale, red	289	512

Representative well logs in the New Providence Boro--Continued

Well 2

Owner: Mr. N. J. Ahl
Owners well number: Ahl
Lat. 404235N Long. 0742352
Altitude, 255 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Clay, gray	90	90
Clay, red	35	125
Triassic (Brunswick Formation):		
Sandstone, red	30	155

Well 4

Owner: Mr. F. R. Porker
Owners well number: Porker
Lat. 404157N Long. 0742318
Altitude, 320 feet

	Thickness (feet)	Depth (feet)
Pleistocene:		
Till	14	14
Triassic (Watchung Basalt):		
Basalt	63	77

REFERENCE NO. 22

Millmaster Onyx/Gulf Oil
Site Assessment

Site Name

Millmaster Chemical Company
Division of Millmaster Onyx Corporation
11 Summit Avenue
Berkeley Heights, New Jersey 07922

Corporate Contact

Mr. Dennis Caputo, Coordinator
Environmental Affairs
2 Houston Center
P.O. Box 3766
Houston, Tx 77253
Telephone (713) 754-3288

Site History

For over a period of thirty years Millmaster Onyx engaged in the manufacture of speciality chemicals and pharmaceuticals at the Berkeley Heights Plant site. Operation at the plant began in 1945. Millmaster Onyx was acquired by Gulf Oil in 1977 when they purchased Kewanee Oil Company and its interests. For economic reasons, in October 1981 the Berkeley Heights Chemical Plant ceased operating. Subsequently in June of 1982 the plant buildings and equipment were dismantled and removed from the site. Later that year in December, Millmaster Onyx was sold by Gulf Oil, however, the Berkeley Heights Plant site was not included in the sale.

During the dismantling of the plant discolored soil was noticed near one of the building. An analysis of a soil sample taken from this area indicated the presence of polychlorinated biphenyl (PCB). After an extensive record search and review and a comprehensive sampling program it was determined that PCB contaminated soil and other hazardous substances currently exist on this site. Gulf Oil is working closely with the NJDEP in developing a remediation plan for this site.

On June 2, 1983, Gulf Oil was infirmed by the NJDEP that this site had been identified by the USEPA of possible dioxin contamination. A review of past records by Gulf Oil indicated that 2,4,5 trichlorophenol (2,4,5 TCP) was used at the plant on only two occasions, once in 1957 and once in 1967. 2,4,5 TCP was used in the manufacture of an amine salt of Silvex and sold to another company. This intermediate product was typically used as a component of herbicide formulations.

NJDEP files for the Millmaster Onyx plant generally begin in the early 1970's. Attachment includes a list of raw materials identified in DEP files as being used by Millmaster in their operations. Attachments B and C describe DEP enforcement actions and environmental incidents which occurred at the plant site during its operation. Attachment D is a site plan of the Millmaster Onyx operation.

As a result of the review of the DEP files for the Millmaster plant it can be ascertained that this process facility at times emitted foul and sickening pollutants into the ambient air resulting in continuous complaints being filed by local homeowners. Numerous times the DEP was called to verify complaints. During one period from August 1977 to March 1979 numerous fines totaling over $6,600 were issued by the Township of Berkeley Heights on Millmaster Onyx.

Attachment A
Raw Materials

The following raw materials have been identified in DEP files as used in process at the Millmaster Onyx plant site.

Isopropyl alcohol
Waste ethanol
Methanol
Isopropanol
n-propanol
Xylene
Decene
Toluene
Diethyl carbonate
Ethylene glycol
Diethylene glycol
Propylene glycol
1-6 hexane diol
2- methyl
2-n-propyl
1,3 propanedial
Decene - 1
n-propyl alcohol
Methyl carbanate crude
2 - methyl
2-m-propyl-1
3-propane diol
Methyl carbamate
Ethyl amine
Ethyl methallyl amine
2-methyl 2-N-propyl propanediol
4t butyl catechol
Crude t-butyl catechol
Crude 2- methyl
2-n-propyl propane diol 1,3
Carisoprodol & Phenformin
Crude ethyl dichlorodimethyl hexenoate
Xylene solution of ethyl dischlorodimethyl hexenoate
Sodium ethylate in ethanol Dimethylamium
Ethanol (3% isoprene)
Tetraethyl orthoacetate
Methyl butenol
Triethyl orthoacetate
Methyl dimethyl pentenoate
Prenol
Carbontetrachloride
Benzoyl peroxide

Attachment B
DEP Enforcement Actions

1. On September 30, 1970, the DEP issued an Order to Millmaster-Onyx to make corrections to specific units in their processes which would result in the lessening of the emission of air contaminants into the outdoor atmosphere.

2. On April 11, 1972, DEP issued Consent Judgement to Millmaster Onyx ordering them to complete corrective actions on the lagoon serving as a holding area for liquid chemical waste and the centrifuge from which xylene is evaporated. These actions were necessary to a reduce the release of air pollutants at the site.

3. On June 5, 1978, DEP issued a Supplemental Consent Order to Millmaster Onyx directing them to install spot ventilation for drum filling and emptying areas by use of carbon canisters and to install a ventilation system for building #10 utilizing an absorber containing five modules in series utilizing approximately 2,500lbs of activated carbon.

Attachment C
Environmental Incidents

1. In 1967 a transformer exploded resulting in a fire at the plant and the release of polychlorinated biphenols (PCB's) at the site. In the 1980's test results revealed high concentrations of PCB's in the soil on a major portion of the plant site.

2. On March 29, 1978, an overflow of a process vessel containing 2,2,dichlorovinyl occurred inside building No.1. It appears that this spill was contained in the building. However, the odoriferous vapors which eminented from the building resulted in numerous complaints from local homeowners.

3. On October 2, 1981, a xylene spill occurred at the plant site resulting in this release flowing into the Passaic River. The Department (Division of Water Resources) imposed a $5,000 on the company as a result of this incident.

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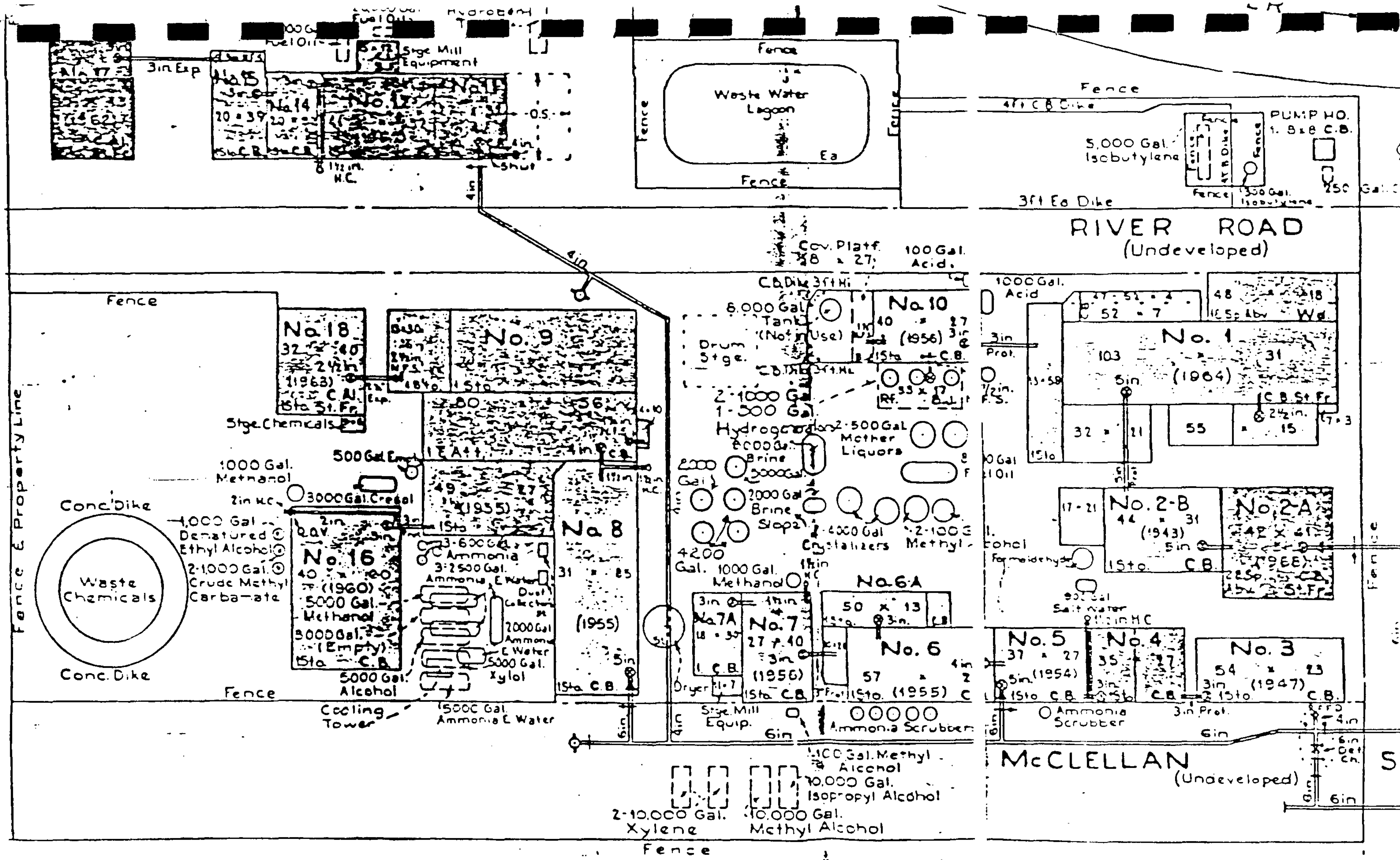

Millmaster Onyx

Plant Site for 1967-1968 (?)

Berkeley Heights, N.J.

Given to W. Samuel

5/10/83